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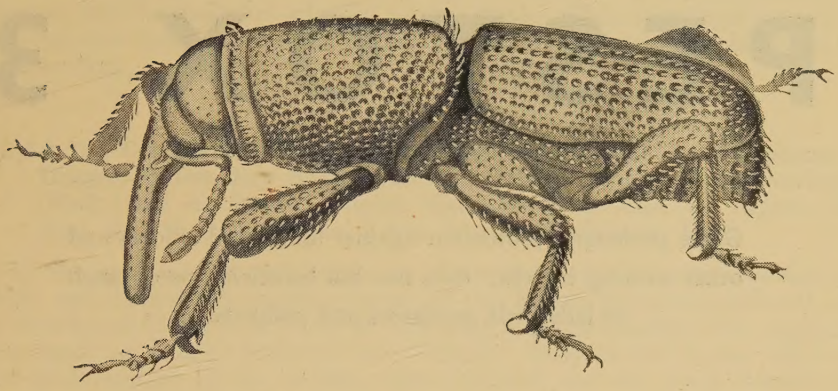

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FEYTAUD (J.). **Le peuple des termites.**—*Que sais-je?* no. 213, 128 pp., 35 figs., 73 refs. Paris, Presses Univ. Fr., 1949.

This booklet, which is intended for the general reader, contains seven chapters dealing with the characters, castes, nests and various aspects of the bionomics of termites, one on their symbionts and natural enemies, and two on their economic importance in buildings, with special reference to the species found in France, and the measures adopted against them. Their social system and the theories that have been put forward regarding its significance are discussed in a final section.

CLARK (L. R.). **Observations on the Plant Communities at "Bundemar", Trangie District, New South Wales, in Relation to** *Chortoicetes terminifera* **(Walk.) and** *Austroicetes cruciata* **(Sauss.).**—*Bull. Coun. sci. industr. Res. Aust.* no. 236, 63 pp., 5 pls., 2 figs., 11 refs. Melbourne, 1948.

In the course of investigations on the ecology of *Chortoicetes terminifera*, Wlk., and *Austroicetes cruciata*, Sauss., in the Bogan-Macquarie outbreak area of New South Wales [*R.A.E.*, A **37** 218–221], a detailed study of the vegetation was made on a large property near Trangie. Only cleared areas, which are the ones infested by the locusts, were included, and the plant communities involved were found to fall into six types, five of which are described in detail. Clearing of the area began about 75 years ago, when sheep were introduced, and the present composition of the pasture is maintained by grazing. *Chortoicetes* is now widespread on the cleared land, and outbreak centres have developed at suitable points where plant communities of different types occur together. A few areas of compact soils in single plant communities favour the production of swarms of *Austroicetes* under a favourable sequence of climatic conditions. The conversion of woodland and scrub into pasture has not only favoured the formation of outbreak centres of the locusts, but has also led to the elimination of insectivorous birds.

MILLER (L. W.). **Insect Pests of Fabrics.**—*Tasm. J. Agric.* **19** no. 2 pp. 96–100, 4 figs. Hobart, 1948.

Notes are given on the bionomics and control of insects that attack fabrics in Tasmania. The two common carpet beetles there are *Anthrenocerus australis*, Hope, and *Attagenus pellio*, L., and the clothes moths are *Tineola biselliella*, Humm., and *Tinea pellionella*, L. *Ctenolepisma longicaudata*, Escherich, attacks rayon, as well as starched fabrics, papers, books, bookbindings and wallpaper.

MYBURGH (A. C.). **The Toxicity of Fruit Fly Baits to** *Pimpla heliophila*, **Cam. (Hymenoptera), a Parasite of the Codling Moth.**—*J. ent. Soc. sthn Afr.* **10** no. 2 pp. 170–174, 1 graph, 4 refs. Pretoria, 1948.

The adoption of biological control methods against *Cydia* (*Carpocapsa*) *pomonella*, L., in pear orchards in Western Cape Province [*R.A.E.*, A **31** 219] is likely to necessitate the use of bait-sprays against fruit-flies, and their toxicity to parasites of *C. pomonella* was accordingly investigated by tests on *Pimpla heliophila*, Cam. The technique was the same as that of experiments against *Ceratitis capitata*, Wied. [**37** 169], and the insecticides were used at concentrations that would give an economical control of this fruit-fly. The sprays contained 6·25 per cent. white sugar with the addition of 0·27 per cent. sodium

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fluosilicate, 0·32 per cent. lead arsenate, or proprietary water-dispersible preparations of DDT or BHC (benzene hexachloride) at concentrations giving 0·1 per cent. DDT or 0·00025 per cent. γ BHC.

The periods in hours required for 50 per cent. mortality of parasites that had emerged on the previous day and included equal numbers of the sexes were 11 for sodium fluosilicate, 17 and 20 for DDT with and without a wetting agent, 120 for lead arsenate and 150 for BHC. Male parasites were more susceptible than females, and the average difference in the period required to kill 50 per cent. of each sex was greatest in the case of BHC (3·2 hours) and least in that of DDT (1·1–1·2 hours). In general, parasites tested one month after emergence were more susceptible than those one or seven days old, but the order of toxicity of the insecticides was the same. The results for each age group thus showed that sodium fluosilicate, which is the standard poison recommended against the fruit-fly in South Africa, and water-dispersible DDT, which was much less effective [**37** 170], are both highly toxic to *Pimpla*, whereas BHC, which was promising against the former, is not.

STOFBERG (F. J.). **New Host of** *Scirtothrips aurantii*, **Faure.**—*J. ent. Soc. sthn Afr.* **10** no. 2 pp. 196–197, 1 fig. Pretoria, 1948.

In March 1944, dark Virginia (snuff) type tobacco on a farm in the Transvaal was found to be heavily infested by *Scirtothrips aurantii*, Faure, which has not previously been recorded from tobacco. Damage due to the thrips had occurred during the previous four or five seasons, and affected as much as 75 per cent. of some blocks of tobacco. The lower leaves are attacked first. Infested leaves become pale in colour and then red, and finally disintegrate ; later, the whole plant becomes pale or yellowish. The quality of the cured tobacco is greatly impaired. Sulphur dusts gave good control in the field, but must be used with care, since they may impair the flavour of the cured leaf.

The source of the infestation is thought to have been a shrub of the genus *Bauhinia*, which is abundant on the farm and is known to be heavily infested by *S. aurantii*, even in winter.

LATIF (A.). **The taxonomic Status of** *Drosicha stebbingi* (**Green**) **and** *Drosicha mangiferae* (**Green**) (**Hem., Coccid.**).—*Bull. ent. Res.* **40** pt. 3 pp. 351–354, 3 figs., 13 refs. London, 1949.

Coccids of the genus *Drosicha* found on mango in the Indian subcontinent have been diversely identified as *D. stebbingi*, Green, *D. mangiferae*, Green, and *D. stebbingi* var. *octocaudata*, Green. In works already noticed, Morrison [*R.A.E.*, A **16** 691] concluded that var. *octocaudata* [*cf.* **28** 466] is a synonym of *D. mangiferae*, and Beeson [**31** 125] considered that *D. stebbingi* is mainly a pest of forest trees such as *Shorea robusta* and that records of it from mango refer to *D. mangiferae*, but other authors have recorded *D. stebbingi* from mango in various parts of India [*cf.* **32** 419]. *D. stebbingi* and *D. mangiferae* have been distinguished chiefly by the presence of six caudal tassels in the males of the former and eight in those of the latter. Males that emerged from pupae collected on mango at Lyallpur, Pakistan, in 1940 included some with six or eight fully developed tassels and others in which one or both of the fourth pair were rudimentary or short. Males of any type paired with the same female. Nymphs reared from eggs deposited by females collected while mating with males with six or eight tassels were examined in all instars, but no distinguishing characters could be detected. The author concludes that *D. mangiferae* is a synonym of *D. stebbingi*.

KRIJGSMAN (B. J.) & BERGER (N. E.). **A simple Method for the Estimation of Contact Insecticides.**—*Bull. ent. Res.* **40** pt. 3 pp. 355–358, 1 graph, 8 refs. London, 1949.

In view of the difficulty of chemical estimation of the content of active material in preparations of certain contact insecticides, a standard method of bioassay, using adults of *Calandra granaria*, L., was developed ; it consists in comparing the median lethal deposit of the pure insecticide with that of the preparation containing it. The weevils are reared from a single pair in wheat and are kept at 25°C. [77°F.] throughout the processes of rearing and testing. The test is made by distributing an even film of the insecticide over the bottom and sides of the lower half of a petri dish and the top of the upper half by continuous movement in them of a known quantity of a solution in a volatile solvent, confining a number of weevils in the dish for one hour and then keeping them in a clean dish for three days. The dead weevils are then counted. Several rates of deposit are tested, and the mortality is calculated by Abbott's formula [*R.A.E.*, A **13** 331]. The average percentage mortality for each weight of deposit is used to construct a mortality curve. The median lethal dose can be estimated by interpolation, though this is difficult, since the curve is sigmoid, or by converting the curve for mortalities between 40 and 90 per cent. into a straight line by the probit method of Bliss [**22** 440]. By the latter method, the median lethal deposits of pure γ BHC (benzene hexachloride), p,p'DDT and chlordan (Velsicol 1068) were estimated as $0{\cdot}1 \pm 0{\cdot}005$, $6 \pm 0{\cdot}3$ and 2·4 mmg. per sq. cm., respectively. Dishes used for the estimation of BHC or chlordan can be cleaned by rinsing with acetone, washing thoroughly with soap and water, and again rinsing with acetone, but those used for DDT should in addition be allowed to stand overnight in kerosene before being washed with soap and water.

KEVAN (D. K. McE.). **Notes on East African Bush Locusts with special Reference to *Phymateus aegrotus* (Gerstaecker 1869) (Orth., Acrid., Pyrgomorphinae).**—*Bull. ent. Res.* **40** pt. 3 pp. 359–369, 22 refs. London, 1949.

The species of *Phymateus* known to occur in East Africa are *P. aegrotus*, Gerst. (of which *P. hildebrandti*, Brunn., is here stated to be a synonym), *P. pulcherrimus*, I. Bol., *P. purpurascens*, Karsch, *P. viridipes*, Stål, and a species that has been recorded from Eritrea as " *P. hildebrandti* or a congeneric species near to it " and is here referred to as *Phymateus* sp. Keys are given to the adults and last-instar nymphs of the four identified species and descriptions of the last-instar nymphs of *P. aegrotus*, *P. purpurascens* and *P. viridipes*.

P. aegrotus is common throughout Kenya, especially in the east, and also occurs in Abyssinia, Somalia, British Somaliland, and northern Tanganyika. It is found at altitudes ranging from a few hundred to over 5,000 ft., mostly in dry grass and thorn-bush country. The adults are solitary, but the hoppers form small bands that cause local damage to crops, especially in the absence of control measures. Scattered adults were recorded in East Africa each year from 1938 to 1947, and in almost every month, though they were most numerous in July and August, but the hopper bands, which appear to be confined to the wet seasons (May–July and November–January) were observed only in 1938, 1943, 1945 and 1946–47. Notable crop damage was recorded only from single areas in Somalia and at Moyale, on the border of Kenya and Abyssinia. No large concentrations of adults were observed immediately before the appearance of hopper bands, from which it is concluded that the eggs remain in the ground for a considerable period before hatching [*cf.* also *R.A.E.*, A **29** 435]. There appear to be five nymphal instars in the male and six in the female, and the nymphal stage lasts 10–12 weeks. Two generations probably develop during the year, corresponding to the rainy seasons, but

in the Eritrean highlands, where there is only one rainy season (July–September), there is only one generation of *Phymateus* sp. Adults of the latter do not become mature for 8–9 months, and it is therefore assumed that the egg and hopper stages together occupy 3–4 months. The hoppers of *P. aegrotus* are gregarious and active throughout their life. They travel in rather long, narrow, rapidly moving bands, normally cover only short distances at a time, rest, mostly on bushes, during the heat of the day, and show a tendency to linger in one area. They feed voraciously while moving, and destroy grass and defoliate bushes and small trees in their path. Control can generally be obtained by beating the bands with branches. Poison baits and a dust of 7 per cent. dinitro-o-cresol are also effective, but baits are not economic, owing to the small size of the bands. Plots can be protected by digging shallow trenches round them.

Of the other East African species, *P. pulcherrimus* appears to be confined to the highlands of Eritrea and Abyssinia, whereas *P. purpurascens* and *P. viridipes* are more generally distributed in tropical Africa, and in Kenya are more frequent in cultivated areas at higher elevations than *P. aegrotus*. The hoppers of all three species form bands and sometimes damage crops. Notes on *P. pulcherrimus* at Addis Ababa, by H. B. N. Hynes, are included. In 1943, last-instar nymphs and a few teneral adults were observed on 2nd September, two weeks after the end of the rainy season, and small hopper bands were reported at slightly lower altitudes. Isolated adults were present in the city from the end of November until early March, when the rainy season began and mating was first observed. Four gravid females dissected on 16th March contained 132–220 eggs. Adults were much scarcer during April, when there were heavy rains, but mating occurred sporadically and a female was observed inserting its ovipositor into sandy soil on the 30th. They were rare in May. No hoppers had appeared by 21st May, when observations ceased. The author concludes that diapause takes place in the adult stage between October and March.

PRADHAN (S.). **Studies on the Toxicity of Insecticide Films. III.—Effect of relative Humidity on the Toxicity of Films.**—*Bull. ent. Res.* **40** pt. 3 pp. 431–444, 1 pl., 4 figs., 22 refs. London, 1949.

In this third paper of a series [*R.A.E.*, A **37** 326, 408], an account is given of experiments on the effect of relative humidity [*cf.* **37** 408] on the toxicity of dry films left by sprays of DDT and DNC (dinitro-o-cresol) to adults of *Tribolium castaneum*, Hbst., and larvae of *Plutella maculipennis*, Curt. The humidity was varied during the exposure period or the subsequent reaction period. It was found that DDT and DNC were more toxic to adults of *T. castaneum* at high relative humidities during either period, but that whereas the toxicity of DNC to larvae of *P. maculipennis* was also higher at high humidity, that of DDT was lower. No general principle regarding the effect of humidity on toxicity could be deduced from these experiments or from the literature, which is briefly reviewed. Results obtained by other workers with various insects and insecticides are given in a table. There appear to be indications that toxicity is influenced only within the higher ranges of humidity and at the higher concentrations of insecticide ; furthermore, the effect of humidity on susceptibility may be different in different stages of the same species of insect.

SIMMONDS (H. W.). **On the Introduction of *Scolia ruficornis*, F., into Western Samoa for the Control of *Oryctes rhinoceros*, L.**—*Bull. ent. Res.* **40** pt. 3 pp. 445–446, 3 refs. London, 1949.

Scolia oryctophaga, Coq., was introduced into Western Samoa against *Oryctes rhinoceros*, L., on coconut in 1939 [*R.A.E.*, A **29** 148], but failed to

become established, possibly because of the absence of a definite cool season, which controls the development of the pupae. An attempt was therefore made in 1945 to introduce *S. ruficornis*, F., from Zanzibar [*cf. loc. cit.*] ; 465 adult females were received in Samoa, and one adult was observed in the field six months after they were released. No other recoveries were made, despite a careful search in April 1947 by F. A. Bianchi, until February 1949, when 20–30 adults were seen flying round a compost heap. The slowness of the parasite in becoming established is attributed to the absence of a suitable concentration of hosts in the right stage at the time of liberation and to the length of its pupal period, which lasts about six months. Its ultimate value will probably depend on the presence of sufficient honey-producing flowers at the right seasons, but the provision of attractive breeding places for *O. rhinoceros* that would render it readily accessible to the parasite is also desirable.

In a letter from C. E. Pemberton, quoted in a supplementary note by the editor, L. J. Dumbleton is stated to have reported that *S. ruficornis* was definitely established in Samoa in August 1949, though adults were found only at the compost heap, which was situated in a cacao plantation about 20 miles from the point of liberation. About 90 per cent. of them were males. No parasitised larvae of *O. rhinoceros* were found, but a single empty cocoon believed to have been made by the parasite was dug up. J. B. Menardi also found adults at the compost heap and not elsewhere.

KURIR (A.). **Auftreten der Buchenblattbaumlaus (*Phyllaphis fagi* L.) auf der Rotbuche in Weidlingbach und Umgebung im Jahr 1946.** [The Occurrence of the Beech Leaf Aphid (*Phyllaphis fagi*) on Red Beech in Weidlingbach and Environs in the Year 1946.]—*Allg. forst- u. holzw. Ztg* **58** no. 13–14 repr. 1 p., 4 refs. Vienna, 1947.

An unusually severe outbreak of *Phyllaphis fagi*, L., occurred on beech (*Fagus sylvatica*) over an area of 136 acres to the north-west of Vienna in the spring and early summer of 1946. The trees were 10–20 years old in mixed stands at altitudes of 1,100–1,400 ft. The Aphids occurred on the lower surface of both young and old leaves, causing them to roll and shrivel, and continued to develop inside the rolls. Other deciduous or coniferous trees were not infested, and repeated observations when alatae were present did not reveal any alternative food-plant. The trees in the centre of the stands were considerably more infested than those on the periphery. The fundatrices occurred in April and early May, and alates from 25th May till 20th June, the peak being reached on 7th June. In one of the stands, the winged Aphids were so numerous that they impeded forest work. However, only a few Aphids occurred in the area in the spring and early summer of 1947, the extinction of the outbreak being probably due to the severity of the intervening winter. The trees showed little ill effect.

KURIR (A.). **Buchdrucker (*Ips typographus* L.)-Kalamität im Raume von St. Valentin und Amstetten 1946–47.** [Outbreak of *Ips typographus* in the Area of St. Valentin and Amstetten in 1946–47.]—*Allg. forst- u. holzw. Ztg* **58** no. 15–16 repr. 2 pp., 1 map. Vienna, 1947. **Borkenkäferbekämpfung im Raume St. Valentin und Amstetten.** [Control of Bark-beetles in the Area of St. Valentin and Amstetten.]—*T.c.* no 19–20 repr. 2 pp.

Investigations in 1946 showed that severe infestation by *Ips typographus*, L., had developed on spruce in the region between the Danube and the rivers Enns and Ybbs in Lower Austria. Three forests were involved, two in the district of St. Valentin in the west, and one near Amstetten, in the east, and the total infested area was about 4 sq. miles. The stands consisted principally

of spruce, and their age varied from 40 to 140 years. All the spruce in one of the forests was attacked, 70 per cent. in the second and 50 per cent. in the third. Predisposing factors were, respectively, injury to trees by bombing, failure to dispose of trees felled in connection with the shifting of a railway line, and storm damage. *I. typographus* was accompanied by *I. acuminatus*, Gylh., and *Polygraphus poligraphus*, L., as secondary pests. Owing to the insufficient measures taken to check these outbreaks, there was a serious danger of the infestation spreading to other forests in the region.

In the second paper, which is a reply to criticisms of the first, the author emphasises the seriousness of the outbreak, points out that sprays of calcium arsenate, which were applied to the bark, could not have any effect on the beetle, and advocates the use of DDT against it, in conjunction with trap logs.

KURIR (A.). **Lärchenwickler** (*Semasia diniana* **Gn.**)**-Gradation in Kärnten 1947.** [Outbreak of the Larch Tortricid in Carinthia in 1947.]—*Allg. forst- u. holzw. Ztg* **58** no. 19–20 repr. 2 pp., 13 refs. Vienna, 1947.

Outbreaks of *Enarmonia* (*Semasia*) *diniana*, Gn., began on larch in 1947 in four valleys in the Carinthian Alps, as part of a general increase of this moth in the eastern Alps [*cf.* also *R.A.E.*, A **37** 444]. The total area affected amounted to some 15½ sq. miles between altitude limits of about 4,000 and 6,250 ft. and 60 per cent. of the trees were completely defoliated in two of the valleys. In mixed stands, spruce and pine were also attacked. Stands 60 and more years old were affected first, but young trees became infested later by larvae that had suspended themselves from the old ones on silk threads. Contrary to the usual records, feeding proceeded from the top of the tree downwards. All the infested stands were on poor, dry soil, and those on the northern slopes were attacked first. The larvae began to pupate towards the end of June, the pupal stage lasted 1–2 weeks, and the adults began to emerge on 1st July and lived for about a fortnight. In three of the valleys, the infested larches were also attacked by larvae of *Coleophora laricella*, Hb. The periodic outbreaks of *E. diniana* usually last three years [*cf.* **18** 434; **37** 444], and only 0·64 per cent. of the larvae and pupae examined in 1947 were parasitised.

DE FLUITER (H. J.). **Over het optreden van virginopare en sexupare gevleugelden bij** *Eriosoma lanigerum* (**Hausmann**) **op appelboompjes in kassen.** [On the Occurrence of alate Virginoparae and Sexuparae in *E. lanigerum* on Apple Trees in heated Greenhouses.]—*Ent. Ber.* **12** no. 279 pp. 209–211, 4 refs. Amsterdam, 1948. (With a Summary in English.)

Two sorts of alatae are produced by *Eriosoma lanigerum*, Hsm., on apple, virginoparae and sexuparae [*cf. R.A.E.*, A **20** 3]. The sexuparae are of great importance for the spread of infestation in America, where the Aphid is holocyclic, but of none in Europe since American elm (*Ulmus americana*), on which alone the fundatrices develop, is almost entirely lacking. Infestation is there spread by the alate virginoparae. These are produced regularly and over a long period in some European countries [*cf.* **14** 221; **17** 119; **18** 602], before the sexuparae, but in Holland they occur only sporadically, at the end of July or beginning of August, and are very much less numerous than the sexuparae, which are produced from August to November [*cf.* **20** 3].

Investigations were made to ascertain whether alatae would be produced on infested apple trees transferred to heated greenhouses during the winter. On one such tree transferred in mid-September, alates were produced from 24th September to 28th October, and examination of their progeny showed that all were sexuparae, which was normal for the time of year. Four others

on which sexuparae had occurred in the autumn were transferred in mid-December ; no alatae were produced on one, but they occurred on the other three in April–May, March and March–May, respectively, of the following year, and all were sexuparae, although there were some intermediate forms among their progeny. Three other trees on which sexuparae had occurred in September and October were transferred in late October, and sexuparae had appeared on one of them by 23rd December, when the observations were broken off.

FRANSEN (J. J.). **Eenige beschouwingen omtrent de kleurvariëteiten en aberraties van den dennenscheerder** (*Myelophilus piniperda* **L.**). [Some Observations on the Colour Varieties and Aberrations of *M. piniperda*.]—*Ent. Ber.* **12** no. 279 pp. 213–216, 10 refs. Amsterdam, 1948. (With a Summary in English.)

The pine bark-beetle, *Myelophilus piniperda*, L., has been considered to possess three colour varieties, *testaceus*, F., *rubescens*, Krausse, and *rubripennis*, Rttr. [*cf. R.A.E.*, A **36** 195], but the author concludes from an examination of beetles collected in the field in Holland that these merely represent successive stages in the darkening of the cuticle corresponding to the age of the beetles and are not therefore true varieties.

VELBINGER (H. H.). **Veratrin-Intoxikation bei Insekten. Beitrag zur Toxikologie der Alkaloide.** [Veratrine Poisoning in Insects. Contribution to the Toxicology of Alkaloids.]—*Süddtsch. Apothekerztg* 1947 no. 9 pp. 220–226, 2 figs., 21 refs. Stuttgart, 1947.

In connection with investigations in Bulgaria on the control of certain orchard pests by means of an extract from the rhizomes and rootlets of white hellebore, *Veratrum album*, which grows wild in the Rhodope mountains and is well-known in that country for its insecticidal properties, a study was made of the toxicology of veratrine, which is the active principle involved. Since the extract from *V. album* did not prove very toxic, medicinal veratrine, which is a mixture of veratridine and cevadine and is obtained from the seeds of the American sabadilla plant, *Schoenocaulon officinale* (*Sabadilla officinarum*) [*cf. R.A.E.*, B **33** 65] was included. Notes are given on the appearance of this plant and the history of the discovery of veratrine, its chemical composition and its properties. Recent investigations have shown that only a small amount of veratrine is present in *V. album*, and that chiefly in the rootlets, though there is some in the rhizome. Protoveratrine appears to predominate and to be more toxic. The toxic effect of veratrine on man and animals is discussed, and an account is given of experiments by the author with over 5,000 insects in various stages of development belonging to 69 species in 49 families. The materials used were an alcohol extract of the dried and powdered rhizomes and rootlets of *V. album* prepared as an emulsion and medicinal veratrine made up as a suspension in water or a dust. The methods employed consisted chiefly in exposing insects to sprayed or dusted surfaces. Evidence was obtained that veratrine also acted as a stomach poison, but the detailed results were lost.

The following is based on the author's conclusions. The insecticidal action of the extract from *V. album* was much inferior to that of medicinal veratrine, the effectiveness of which was probably due to its content of cevadine [*cf.* A **34** 302]. Veratrine acted chiefly as a contact poison and was effective against a great number of different insects. When tested as a spray against nymphs of *Carausius morosus*, F., the minimum lethal concentration was 0·25 per cent., and 0·5 per cent. was as effective as 1 per cent. owing to a repellent effect at the higher concentration. For dusts, the minimum lethal

dose for several insects was less than 0·5 mmg. per sq. cm. As a fumigant, veratrine affected only a few species, and it took several days to kill them. The action of veratrine on the central nervous system of insects and the symptoms of intoxication are described. They were similar to those observed in vertebrates. Paralysis of the wing muscles and weakening of the phototactic reaction occurred relatively late.

The extent, mode and duration of the reaction of insects to the toxic effects of the poison varied with species, individual insects, and stage of development. On the whole, larvae or nymphs were more resistant than adults. A list is given of some of the insects tested, showing their relative susceptibility. The reaction to the poison was found to be directly dependent on temperature, through its effect on metabolism. Special experiments, in which insects were brought in contact with treated ivy leaves that had been exposed to heavy rain for 12 hours, showed that the deposit had lost little of its toxic action ; cevadine is insoluble in water.

VELBINGER (H. H.). **Wirkung und Anwendung des Phenothiazins als Antiparasiticum. Neue Untersuchungen zur Feststellung der vermiziden und insektiziden Wirksamkeit.** [Action and Application of Phenothiazine as an Antiparasitic. New Investigations on its vermicidal and insecticidal Effect.]—*Dtsch. tierärztl. Wschr.* **54** no. 17–18 pp. 130–133, 5 refs. Hanover, 1947.

The author discusses the toxicity of phenothiazine to insects and parasitic worms and reviews the results of some of his own experiments with insects, from which he concludes that it acts as a cerebrospinal contact poison and has about the same range of effectiveness as rotenone. It is more toxic to many insects than rotenone, but less so than DDT. It was shown to be effective against various insects, including fleas and lice [*cf. R.A.E.*, B **38** 28].

VELBINGER (H. H.). **Beitrag zur Toxikologie des "D.D.T."-Wirkstoffes Dichlor-diphenyl-trichlormethylmethan.** [Contribution to the Toxicology of DDT.]—*Pharmazie* **2** pt. 6 pp. 268–274, 1 fig., 20 refs. Berlin, 1947.

VELBINGER (H. H.). **Zur Frage der "D.D.T."-Toxizität für Menschen.** [On the Question of the Toxicity of DDT to Man.]—*Dtsch. Gesundhwes.* **2** pt. 11 repr. 8 pp., 8 refs. Berlin, 1947. (With Summaries in Russian, English and French.)

In the first of these papers, the author discusses the toxicity of DDT to insects and other Arthropods, to warm-blooded animals in general and to man. The second paper is almost identical with the last part of the first.

DDT acts by contact primarily as a cerebrospinal poison, and its high contact toxicity to Arthropods has been attributed to its lipoid solubility [*cf. R.A.E.*, A **35** 203]. The author considers that penetration of the nervous system is not always involved, however, since some insects, such as *Nemeritis canescens*, Grav., react so quickly to contact with DDT that this could hardly have time to take place. A direct action on the chemoreceptive organs may also be involved, and the number and distribution of these organs are important factors influencing toxicity. The symptoms of DDT poisoning in insects are described. In the author's observations, cases of recovery were few.

In experiments in which DDT was administered orally in codliver oil, milk or food, doses of 250–500, 300–500, 300–500, 500–750, 1,500 and 2,000 mg. pure DDT were tolerated by fowls, guineapigs, cats, dogs, a sheep and a cow weighing 1, 0·6, 2·5, 1·5, 30 and 600 kg., respectively.

When amounts of DDT rising from 250 to 1,500 mg. as suspensions in milk or solutions in codliver oil were swallowed by the author and two volunteers,

each time after a meal, doses of 250 and 500 mg. had little effect, especially in milk, 750 and 1,000 mg. both caused pain in the lower part of the face and some disturbance of balance in walking, and 1,500 mg. caused hyperalgesia and hyperaesthesia in the region of the mouth and in the feet and lower part of the legs, considerable disturbance of balance and trembling of the arms. These symptoms reached their peak after ten hours, but had almost entirely disappeared after 12 hours' sleep. The findings of the physicians who supervised the test are described in detail.

HEATH (G. D.). **An improved Method for the Generation of insecticidal Smokes.**—*J. Soc. chem. Ind.* **68** pp. 41–44, 1 fig., 2 refs. London, 1949.

Insecticidal smokes produced by burning mixtures in which the fuel is sucrose [*R.A.E.*, A **37** 480] are liable to ignite on issuing from the container unless cooled by a baffle. In the investigations described in this paper, the results of which are noticed in more detail elsewhere [B **38** 27], this difficulty was avoided by the use of substitute fuels, a very efficient smoke being produced by a mixture of 12 per cent. thiourea, 7·3 per cent. urea, 25·8 per cent. potassium chlorate and 54·9 per cent. DDT or BHC (benzene hexachloride). About 90 per cent. of the insecticide in the mixture was recoverable from the smoke. The recommended proportions were based on experiments with DDT; they could probably be altered with advantage if BHC is used, since it is more stable to heat.

Service and Regulatory Announcements, July-December 1948.—*S.R.A., B.E.P.Q.* nos. 173–174 pp. 73–115, 117–141. Washington, D.C., U.S. Dep. Agric., 1949.

The first part (B.E.P.Q. no. 173) includes a revised summary of plant-quarantine import restrictions in the United Kingdom (including the Channel Islands) and supplements to summaries of restrictions in Bermuda [*R.A.E.*, A **36** 209], France [**37** 226], Germany [**24** 803; **25** 517, 628; **26** 229, 751], Turkey [**26** 229; **27** 274; **28** 223] and Venezuela [**36** 105; **37** 108].

The second part (B.E.P.Q. no. 174) includes administrative instructions relating to the Nursery Stock, Plant and Seed Quarantine (No. 37) extending the list of approved packing materials for use with restricted plants imported into the United States, etc. [*cf.* **37** 227]. It also includes summaries of the current domestic and foreign plant quarantines of the United States and of other restrictive orders under the Plant Quarantine Act [**17** 163] and of plant-quarantine import restrictions in Holland and in Belgium, and supplements to summaries of restrictions in Australia [**27** 274, 344, 592; **28** 90, 223] and Switzerland [**27** 344].

LODEN (H. D.) & LUND (H. O.). **Chlorinated Camphene and Parathion to control the Cotton Boll Weevil and Cotton Aphid.**—*J. econ. Ent.* **41** no. 6 pp. 851–853, 1 ref. Menasha, Wis., 1948.

In tests with dusts against *Anthonomus grandis*, Boh., and *Aphis gossypii*, Glov., on cotton in Georgia, weekly applications were made, beginning on 4th July when 22 per cent. of the bolls were punctured by weevils; 20 per cent. chlorinated camphene [toxaphene] was applied three or six times at the rate of 16 lb. per acre, and 1 per cent. parathion and calcium arsenate six times at rates of 16 lb. and about 6–8 lb. per acre, respectively. Weekly infestation counts from 11th July to 14th August showed that toxaphene appeared to remain effective against the weevil for over three weeks after application and that although the treatments with calcium arsenate and toxaphene for six

weeks resulted in significant and statistically equal control, the latter acted the more rapidly. Parathion was unsatisfactory [*cf. R.A.E.*, A **37** 423]. Infestation by *A. gossypii* was lower on the plots dusted with toxaphene than on the untreated plots or those receiving calcium arsenate, which increased the infestation, but much lower still on those treated with parathion, though neither toxaphene nor parathion remained effective for as long as two weeks after application. Yields were low, but those from plants dusted with toxaphene for six weeks were significantly higher than those from untreated plants or those treated with toxaphene for three weeks or with parathion. Separate tests in a field that became heavily infested by the Aphid owing to recent treatment with calcium arsenate showed that toxaphene, 2 per cent. nicotine sulphate in calcium arsenate, and a mixture of DDT and benzene hexachloride were significantly and equally effective in reducing infestation, and that parathion was much superior to any of them. Increasing the rate of application of toxaphene, parathion or the DDT mixture from 16 to 32 lb. per acre did not significantly increase control.

STEINHAUS (E. A.). **Polyhedrosis, ("Wilt Disease") of the Alfalfa Caterpillar.**—*J. econ. Ent.* **41** no. 6 pp. 859–865, 3 figs., 9 refs. Menasha, Wis., 1948.

A preliminary account is given of investigations in California on a polyhedral (wilt) disease of the larvae and pupae of *Colias eurytheme*, Boisd., on lucerne, including information on the symptoms, general histopathology and pathogenesis, the causative virus and epizootiology.

The causal organism was previously thought to be a bacterium [*cf. R.A.E.*, A **33** 81], but the latter, which is of doubtful identity, has proved non-pathogenic. The disease is sometimes of great importance in reducing infestation [*cf. loc. cit.*].

STITT (L. L.) & EIDE (P. M.). **New Insecticides for Cabbage Maggot Control in western Washington.**—*J. econ. Ent.* **41** no. 6 pp. 865–869. Menasha, Wis., 1948.

Hylemyia brassicae, Bch., is a serious pest of many cruciferous crops in western Washington, and some of the newer insecticides were tested against it in 1947. Following tests at Puyallup indicating that suspensions of BHC (benzene hexachloride) watered round the transplants reduced damage by the maggot but were liable to injure the plants, various dusts were compared on broccoli sown in April and transplanted on 6th June. Two applications were made round the bases of the plants, the first on 17th June, which was too late after transplanting for optimum results, and the second on 14th July, and the percentages of plants classed as infested on 8th–11th August and 30th September, respectively, were 18·2 and 16·8 for a BHC dust containing 0·5 per cent. γ isomer, 26·4 and 26·2 for 5 per cent. chlordan, 54·2 and 75·2 for 5 per cent. chlorinated camphene [toxaphene], 37·8 and 93·8 for 5 per cent. mercurous chloride (calomel) and 88·2 and 99 for no treatment. No injury to the underground parts of the plants was evident on plots treated with BHC or chlordan.

On cabbage at Mount Vernon, BHC worked into the soil of plant beds before planting, at the rate of 1, 2, 4 and 8 lb. γ isomer per acre, gave 72·5, 98·5, 99·5 and 99·25 per cent. plants free of commercial injury, respectively; although 2 lb. per acre gave good commercial control, it was not repellent to the adults, many eggs being deposited. DDT mixed with the soil at the rate of 160 lb. 10 per cent. dust per acre gave poor control, as did dusts containing DDT, BHC, toxaphene, chlordan, or mercurous chloride applied to the plants three weeks after they were up, possibly because oviposition had begun before the dusts

were applied. Dusts containing 1 per cent. γ BHC or 5 per cent. chlordan or toxaphene, applied by means of a fertiliser or duster attachment on the transplanter, gave practically no control because they were not deposited in the right places.

Greenhouse tolerance tests in which liquid formulations were used indicated that various degrees of injury to cabbage plants occurred when BHC was applied in contact with the roots, though a formulation containing the pure γ isomer caused less damage than one containing a mixture of all the isomers, and the damage was apparently aggravated by the addition of phosphoric acid. Chlordan and toxaphene caused no plant injury in any of the tests.

SMALLMAN (B. N.). **Residual Insecticides for the Control of Spider Beetles in Cereal Warehouses.**—*J. econ. Ent.* **41** no. 6 pp. 869–874, 11 refs. Menasha, Wis., 1948.

Ptinids are the most important insect pests of warehouses in which flour is stored in western Canada, because of their habit of laying eggs through the mesh of cotton flour sacks. *Ptinus villiger*, Rttr., is the commonest, but *P. fur*, L., and *P. raptor*, Sturm, also occur. The adults emerge in late summer, but do not oviposit until the following spring, and it is only during April–July that warehouse stocks require protection. This is most likely to be provided by insecticides that leave an effective residue, and the results of applying such materials were investigated in warehouses in Manitoba. An oil solution and a water suspension each containing 5 per cent. DDT (w/v) were applied at rates giving average deposits of 204 and 238 gm. DDT per 1,000 sq. ft., and an oil solution containing 0·5 per cent. γ BHC (benzene hexachloride) at 20 gm. γ BHC per 1,000 cu. ft. to the floor and lower 5 ft. of the walls in a coarse spray ; smoke pellets containing 3 per cent. γ BHC were burnt on small squares of tin after the ventilators and doors of the warehouse had been shut to give 17 gm. γ BHC per 1,000 sq. ft. ; and magnesium- and aluminium-oxide dusts, which are non-toxic but kill insects by desiccation, with mean particle sizes of 0·5 and 1 μ, respectively, were applied with a dust gun at 46 and 59 gm. per 1,000 sq. ft. The dusts and the smoke treatment created a cloud that settled on the floor, and the dosages were calculated on the basis of floor areas. Treatments were applied in April, and the results were assessed by counting the eggs or larvae in test sacks of flour during June, August and November. DDT in oil or water and BHC in oil were all very effective (94–99 per cent. reduction as compared with no treatment), and there was no significant difference between them. Aluminium and magnesium oxides reduced infestation by 83 and 84 per cent., but BHC smoke gave no significant protection. The odour of BHC soon disappeared in the sprayed sheds, but persisted for several weeks in those treated with the smoke and was in some cases reported from cereal products, though the flour within the sacks was apparently unaffected. Retreatment of warehouses in June failed to give significantly better results than the single treatment in April.

In a further investigation, cotton flour sacks were immersed in a solution of technical DDT or DDD (dichlordiphenyldichlorethane) in carbon tetrachloride to produce a deposit of approximately 120 mg. per sq. ft., and these and paper sacks with gummed closures were filled with flour and exposed with untreated sacks of flour in untreated sheds from April until November. The mean numbers of Ptinids per sack were 62·1 in untreated cotton sacks, 0·3 and 0·6 in cotton sacks treated with DDT and DDD, respectively, and 0·1 in untreated paper sacks, showing that the treated cotton sacks and the paper sacks gave essentially complete protection.

METCALF (R. L.). **Acaricidal Properties of Organic Compounds related to DDT.**—*J. econ. Ent.* **41** no. 6 pp. 875–882, 17 refs. Menasha, Wis., 1948.

Since most, if not all, of the newer chlorinated-hydrocarbon insecticides are ineffective against Tetranychids and their use may result in a pronounced increase in populations of these mites, about 100 organic compounds more or less closely related to DDT were tested for acaricidal activity against *Paratetranychus citri*, McG., and for insecticidal activity against *Heliothrips haemorrhoidalis*, Bch., which were exposed to equivalent residues on oranges. The following is largely based on the author's conclusions.

DDT and all the related trichlorethanes with varying para-para substituents studied, most of which showed insecticidal activity, had no acaricidal action. Alterations in the ring structure of the aromatic trichlorethanes to include naphthyl, chlornaphthyl, thienyl, chlorthienyl, methylthienyl and bromothienyl resulted in greatly decreased insecticidal action. Changes of the trichlorethane portion of the DDT molecule to give 2, 2-bis(parachlorphenyl)-1,1-dichlorethylene, -1-chlorethylene, -ethylene, -1,1,1-trifluoroethane and -ethane produced compounds with little insecticidal activity, but of which the acaricidal activity increased in the order given, except that the last two were equally effective. Di(parachlorphenyl)methane, however, was even more effective as an acaricide and also effective as an insecticide (though less effective than DDT) ; it was the only compound that had this double activity. The acaricidal effectiveness of 2,2-bis(parachlorphenyl)ethane and of 2,2-bis(parachlorphenyl)-1,1,1-trifluoroethane appears to indicate that the theory that effectiveness is due to lipoid solubility conferred by the trichlormethyl group, which has been suggested to explain the action of DDT on insects [*cf. R.A.E.*, A **35** 203], is not applicable to acaricides. Therefore, it is probable that there are distinct physiological differences in the insect and mite integument or nervous system or both.

In a series of compounds related to DDT but having oxygen atoms in the aliphatic portion of the molecule, 1,1-bis(parachlorphenyl)ethanol possessed outstanding acaricidal effectiveness. The activity of this compound was lost by ether formation, by replacement of the hydroxyl group by chlorine or by removal of the methyl group. Acaricidal activity was found in di(parachlorphenyl)ether, di(parachlorphenyl)sulphide, parachlorbenzyl-parachlorphenyl ether, and parachlorbenzyl-parachlorbenzoate and reached a maximum in di(parachlorphenoxy)methane. The acaricidal effectiveness in para-para substituents of diphenoxymethane decreased in the order Cl, Br, CH_3, NO_2 and CH_3O. In the related benzyl-phenyl ethers, substitution of chlorine in other than the para-para positions resulted in greatly decreased acaricidal action. This maximum effectiveness associated with the p,p'-chlorphenyl groups is a characteristic of DDT insecticides, and conforms to the theory that the di(parachlorphenyl) group is a toxophore [*cf. loc. cit.*]. In a series of compounds containing a single parachlorphenyl group, only 2-(parachlorphenyl)-1,1,1-trichlorethanol showed any insecticidal or acaricidal effectiveness.

The relative effectiveness of the two most effective acaricides included in this series, di(parachlorphenoxy)methane and 1,1-bis(parachlorphenyl) ethanol, was 40 : 1 against *P. citri* and 1 : 3 against *Tetranychus bimaculatus*, Harvey, indicating that a marked degree of specificity is found in acaricides. Oranges dipped in 1 per cent. solutions of either of these compounds were still lethal to *P. citri* after two months of exposure out of doors.

PAINTER (R. H.) & JONES (E. T.). **Resistance of the Pawnee Wheat Variety to Hessian Fly under Kansas Conditions.**—*J. econ. Ent.* **41** no. 6 pp. 882–886, 4 figs., 6 refs. Menasha, Wis., 1948.

The authors review the literature on the resistance of the Pawnee variety of wheat to the hessian fly [*Mayetiola destructor*, Say] in Kansas and describe

investigations on the behaviour of the fly on it under farm conditions and the effect of the planting of this variety on the fly population. They conclude that its resistance to the fly has been clearly evident in most areas and has contributed to its rapid acceptance and use in central Kansas [*cf. R.A.E.*, A **35** 23]. Its fly-resistance has persisted well under farm conditions. There has been some evidence that the population able to infest Pawnee wheat has increased in some areas [*cf. loc. cit.*], but more data, taken over a longer period, are required to establish this. A considerable proportion of the larvae that reach the feeding position on plants of this variety do not mature, and this may have been responsible for a general reduction of the fly population in central Kansas in 1947.

Gould (E.) & Hamstead (E. O.). **Control of the Red-banded Leaf Roller.**— *J. econ. Ent.* **41** no. 6 pp. 887–890. Menasha, Wis., 1948.

Eulia (*Argyrotaenia*) *velutinana*, Wlk., has recently become the most destructive insect pest of apples in the Shenandoah-Cumberland fruit belt of the United States. The standard lead-arsenate sprays formerly used appear to have given effective control, and their replacement by DDT sprays has been followed by a steady increase in leaf-roller populations throughout the belt, until the outbreak was widespread in 1948 and damaged nearly 50 per cent. of the crop [*cf. R.A.E.*, A **37** 381]. This is not considered to have been entirely due to the extensive use of DDT, as, though the latter may have destroyed many natural enemies, the leaf-roller was abundant on all types of vegetation in places remote from areas in which DDT had been used. Adults were very abundant during the last week of March and throughout April in 1948, and insecticides were therefore tested against larvae of the three generations. The most effective materials used against the first generation were DDD (dichlor-diphenyldichlorethane), toxaphene and parathion ; lead arsenate and DDT gave fair control but were not satisfactory against heavy infestations at practical concentrations. The minimum effective concentration of DDD appeared to be 1 quart 25 per cent. concentrate per 100 gals., though concentrations as low as half this gave a very high degree of control. The compound was much more effective in the liquid form than as a wettable powder, about 2 lb. 50 per cent. wettable powder being equivalent to 1 U.S. quart 25 per cent. concentrate. The spray should be applied when the larvae are most numerous, and a single application properly made practically destroys the population. Liquid DDD also gave striking results against second- and third-generation larvae. In the full schedule, it was used at the rate of 3 pints per 100 gals. in the petal-fall spray and at 2 pints in the five cover sprays, with complete control. The effectiveness of the liquid appeared to be due to the fact that it readily penetrated the webs and reached the larvae within them. DDD appeared to be safe for use on fruit and foliage and was used with flotation sulphur in the petal-fall and first two cover sprays without definite indications of injury. Liquid DDD was also toxic to the adults, and residues from it retained a rather high degree of toxicity to larvae for 10–14 days, but it showed little toxicity to the pupae.

Toxaphene was used at 1 lb. per 100 U.S. gals. in the petal-fall and five cover sprays and gave good control throughout the season, being extremely toxic to the larvae and not injurious to fruit or foliage.

Parathion gave excellent control of the first generation when used at concentrations as low as 1 oz. per 100 U.S. gals. in the petal-fall and first two cover sprays, though there was a slight increase in control with increase in concentration up to 4 oz., but a minimum of more than 4 oz. was required against the second and third generations. Control was increased by repeated applications, and the material seemed to be readily compatible with all other materials tested and caused no injury to fruit, foliage or cover crop.

Lead arsenate did not give satisfactory control of the first-generation larvae of *Eulia*, owing to rapid growth of new foliage on which they fed, but was more effective against the second and third generations, when it was easier to keep the foliage covered with spray. DDT was also more effective against the second and third generations than against the first, but the minimum effective concentration was 3–4 lb. per 100 U.S. gals.

GUNTHER (F. A.), CARMAN (G. E.) & ELLIOT (M. I.). **Inhibition of the Field Decomposition of DDT Spray Deposits on *Citrus*; preliminary Results.**—*J. econ. Ent.* **41** no. 6 pp. 895–900, 5 figs., 7 refs. Menasha, Wis., 1948.

Periodical chemical analysis of the deposits on the leaves of orange trees sprayed thoroughly with 3 lb. technical DDT or 4 lb. 75 per cent. wettable concentrate of DDT per 100 U.S. gals. 9 per cent. kerosene emulsion or water, respectively, showed that only 4–5 per cent. of the initial residue remained after 130 days and indicated that any DDT undergoing alteration on the leaves was decomposed by way of the ethylenic derivative. It therefore appeared that dehydrohalogenation was the main reaction in the field decomposition of DDT and that inhibiting this process would result in increased stability. It is the result of thermal decomposition, which is catalysed by traces of iron, and further laboratory investigations [*cf. R.A.E.*, A **37** 285] indicated that glycerol, glycerol dichlorhydrin and phenylbiguanide satisfactorily prevented it. These three compounds and picolinic acid were investigated on orange and grapefruit trees in the field in California for over two years, and the results indicate that they have considerable promise as inhibitors of the field decomposition of DDT in kerosene sprays on *Citrus*.

In view of this, the authors report on certain aspects of the field results available. The following is based on their summary and conclusions. All four compounds were found to antagonise or partly inhibit the iron-catalysed decomposition of spray deposits of DDT in kerosene on grapefruit and orange leaves in the field, the picolinic acid exhibiting pronounced inhibiting properties. These materials were ordinarily used at 5 per cent. of the weight of the DDT in the spray mixture, although both glycerol and phenylbiguanide were tested at several concentrations, and they stabilised the retention of DDT on orange for 87 days. The process was affected by high leaf temperatures, which accelerated DDT composition. The available evidence indicates that the manner in which the spray mixture is formulated may be critical to the optimum field performance of the inhibitors.

MELVIN (R.) & EARLE jr. (H. H.). **A new Evaluation Method for Acaricides using the Red Spider Mite.**—*J. econ. Ent.* **41** no. 6 pp. 901–903, 2 figs., 2 refs. Menasha, Wis., 1948.

In studies on TEPP (tetraethyl pyrophosphate), which is non-ovicidal and only slightly toxic to quiescent forms of *Tetranychus bimaculatus*, Harvey, but highly toxic to active forms of the mite, it became apparent that, in order to evaluate samples in which the TEPP content was approximately equal, it would be necessary to devise a method in which only the active mites would be considered in the calculations. The method described in this paper was therefore developed. Leaves from bean plants, grown in a greenhouse and infested with *T. bimaculatus*, were put in a four-litre erlenmeyer flask, which was laid on its side and closed with a rubber stopper. Air circulation was maintained under pressure through two glass tubes passing through the stopper, and served to prevent condensation and hasten the drying of the leaves. The mites left the leaves as they dried and were attracted by a light above the flask.

When sufficient mites had accumulated, the flask was placed upright, and the mites attracted to the mouth were transferred to potted bean plants, about five inches high, some 75 mites being placed on each of the two primary leaves. After two hours, which was long enough for the mites to become established and engorge and short enough to minimise the numbers of eggs laid and of individuals transforming to a quiescent stage, the tops of the plants were submerged momentarily in a beaker of the test solution or emulsion. Counts were made by means of a binocular microscope 20–24 hours after treatment, except for compounds that were known to be slow in toxic action, for which they were made after 2–4 days. Generally two or more plants were treated with each of several dilutions of the test material, the percentage mortality was plotted against concentration on logarithmic—probability paper, a line was fitted by eye and the median lethal concentration found by interpolation. As a standard, a sample of pure TEPP was similarly tested and its median lethal concentration established for the particular group of mites. By comparing the average of the median lethal concentration of the standard with that of the unknown in a series of duplicate tests, the percentage of TEPP in the latter was calculated.

The method was found applicable for comparing the resistance of various species of mites to an acaricide ; a species of *Paratetranychus* feeding on wild raspberry was approximately five times as resistant to TEPP as *T. bimaculatus* from the greenhouse.

MELVIN (R.). **Effect of Dusts on the Performance of Tetraethyl Pyrophosphate.** —*J. econ. Ent.* **41** no. 6 pp. 903–904, 2 refs. Menasha, Wis., 1948.

During tests of TEPP (tetraethyl pyrophosphate) against mites on bean leaves, it was observed that mortality was invariably lower if the leaves had dirt on them than if they were clean, and since it was considered that this might explain some of the erratic field results obtained with this compound, investigations were carried out using active forms of *Tetranychus bimaculatus*, Harvey, colonised on bean plants [*cf.* preceding abstract].

In the first test, the infested plants were dipped in a preparation of 37·4 per cent. TEPP diluted in water (1 : 160,000) and dusted lightly with various substances while still wet. The percentage mortalities after 24 hours were 47, 25, 12 and 10 for coarse sand, granulated sugar, pulverised shale and fuller's earth, and 8, 8, 6 and 3 for soluble coffee, pulverised quartz, Celite 209 [finely divided diatomaceous earth] and fine loam, as compared with 83 when no dust was used. The comparatively high mortality with sand may have been due to the size and weight of the particles, which prevented good distribution on the leaves. In the second test, the plants were dipped in various dilutions of 17 per cent. TEPP and one group was dusted with pyrophyllite just before treatment, the second was dusted just after treatment, and the third was not dusted. The percentage mortalities in the three groups were 6, 1 and 100 for a dilution of 1 : 5,000, 4, 5 and 100 for 1 : 10,000, 3, 2 and 100 for 1 : 20,000, 2, 3 and 86 for 1 : 40,000, and 2, 1 and 43 for 1 : 80,000. In the third test, the plants were dipped in the 37·4 per cent. TEPP at 1 : 160,000 and dusted with pyrophyllite immediately and at various intervals after treatment. The percentage mortalities were 8 and 27 for dusting immediately and after ten minutes, and 94, 99, 99 and 100 for dusting after 0·5, 2, 4 and 6 hours, showing that dusting has little inhibitory effect after the plants have dried.

It was further found that when dust diluents or 50 per cent. wettable DDT powder were mixed with TEPP solutions, they reduced toxicity, the percentage mortality caused by one such solution being reduced from 95 to 9 when the DDT wettable powder was added at the rate of 4 lb. per 100 U.S. gals., and that the addition of wetting agents did not prevent the foreign material from

interfering with the action of the TEPP. In preliminary tests, the toxicity of parathion was also reduced by dusting the plants with pyrophyllite or by adding DDT wettable powder to it.

FLEMING (W. E.). **Chlordan for Control of Japanese Beetle Larvae.**—*J. econ. Ent.* **41** no. 6 pp. 905–912, 6 figs., 1 ref. Menasha, Wis., 1948.

The following is substantially the author's summary. Studies on the value of chlordan mixed with the surface soil or applied to turf for the control of larvae of *Popillia japonica*, Newm., were continued in New Jersey in 1948 [*cf. R.A.E.*, A **37** 305]. Chlordan appeared to be 70 times as toxic as DDT and 7,000 times as toxic as lead arsenate to them when freshly applied, but it was evident that at least 10 lb. chlordan per acre was required for a durable effect. The toxicity of chlordan was unaffected by the source of the material or the form (dust, suspension or emulsion) in which it was applied to turf. Its speed of insecticidal action, like that of DDT and lead arsenate, increased with the temperature of the soil, 40°F. being apparently the threshold of action against the larvae, and chlordan used at 5 lb. per acre acted 2·5 times as fast as DDT at 25 lb. and 6·25 times as fast as lead arsenate at 500 lb. The speed of action of chlordan was not modified significantly by the origin or texture of the soil, but was reduced in poorly drained, inadequately aerated soils. The composition of the mineral aggregates in the various soils seemed to have little influence, but organic matter retarded the insecticidal action. Essentially the same results were obtained in a given type of soil wherever it occurred, and although the type of soil had some influence on insecticidal action, it seemed in general relatively unimportant.

Chlordan at 10 lb. per acre was very effective in controlling larvae of *P. japonica* in turf; from present indications, it will keep turf free from injury for at least two years. Applied at that rate as late as 9th August and worked into the upper 3–4 inches of soil, it eliminated infestations in blocks of ornamental nursery stock by mid-September. It was also effective against larvae of *Anomala orientalis*, Waterh., *Aserica* (*Autoserica*) *castanea*, Arr., and *Cyclocephala borealis*, Arr., and had no injurious effect on the common grasses, spring rye, soy beans, maize, evergreen nursery stock, strawberries or most of the garden vegetables and annuals that were tested.

KULASH (W. M.). **Benzene Hexachloride-DDT Combination Dust for Pest Control.**—*J. econ. Ent.* **41** no. 6 pp. 912–913. Menasha, Wis., 1948.

In tests of various insecticides in North Carolina an experimental planting of snap beans heavily infested by *Elasmopalpus lignosellus*, Zell., was treated on 1st September with a spray of 60 gm. 50 per cent. wettable DDT powder per U.S. gal. applied to the base of the plants at the rate of 1 U.S. gal. per 50 ft. of row and a dust containing 3 per cent. γ BHC (benzene hexachloride) and 5 per cent. DDT applied to the rows at about 10 lb. per acre. Examination of batches of ten larvae collected four and 24 hours later showed two and three dead on sprayed plots, four and four on dusted plots and none on untreated ones. Larvae were not found outside the sprayed plants but were easily found in them, indicating that they were not immediately affected by the treatment, but numerous larvae showing symptoms of poisoning were found outside the dusted plants. Neither treatment appeared to injure the beans.

Aphis gossypii, Glov., and thrips on seedling cotton were controlled with the same dust of BHC and DDT, and unidentified Aphids on experimental plantings of *Lotus uliginosus* with another containing 1 per cent. γ BHC and 5 per cent. DDT. Aphids, probably *Myzus persicae*, Sulz., were abundant in many tobacco fields late in the season, just before the priming of tobacco,

and were not controlled by a spray of nicotine sulphate (1 : 800), but thorough applications of a dust of 0·8 per cent. γ BHC, a spray of 0·1 per cent. hexaethyl tetraphosphate and the dust containing 1 per cent. γ BHC and 5 per cent. DDT all caused noticeable reductions in population within five days, the dust mixture resulting in the fewest living Aphids and the spray in the most. The spray caused no plant injury, but both dusts caused some damage to the leaves. In another test against Aphids on tobacco, 5 per cent. dusts of chlorinated camphene [toxaphene] and chlordan both caused 70 per cent. reduction in 24 hours.

Adults and nymphs of the three-cornered alfalfa treehopper (possibly *Stictocephala festina*, Say) were found on lucerne late in the season near Raleigh ; the injury consisted of a girdling of the stems at one or two places 1–2 inches above ground level. In nursery plantings, this Membracid was controlled by one application of the dust containing 3 per cent. γ BHC and 5 per cent. DDT at about 10 lb. per acre.

Ingram (J. W.), Bynum (E. K.) & Charpentier (L. J.). **Experiments with Insecticides against the Sugarcane Borer in 1947.**—*J. econ. Ent.* **41** no. 6 pp. 914–918. Menasha, Wis., 1948.

An account is given of further tests of new insecticides for the control of *Diatraea saccharalis*, F., on sugar-cane in Louisiana, in which treatments were applied four times at weekly intervals, except when otherwise stated, against the various generations of the borer [*cf.* *R.A.E.*, A **37** 285]. The standard of comparison was synthetic cryolite dust, which gave 72–91 per cent. control of the first generation, 67–75 per cent. of the second and 18 per cent. of the third in tall cane, and 65 and 89 per cent. of the third and fourth in summer-planted cane. A dust containing 40 per cent. *Ryania* was as effective as cryolite against the first generation in one test, but less so in three others, and undiluted wettable *Ryania* applied at 5 lb. per 80 U.S. gals. water per acre in a single test gave better control (98 per cent.) than cryolite. The 40 per cent. dust was slightly less effective than cryolite against the third and fourth generation in summer-planted cane, but gave better control of the second generation. When applied by aeroplane, 40 per cent. *Ryania* dust gave less control of the first generation than cryolite from the ground and higher infestations at harvest, but resulted in a yield of 112 lb. more sugar per acre ; it gave about the same control of the second generation as cryolite, but resulted in 110 lb. less sugar per acre. *Ryania* did not materially increase the population of *Sipha flava*, Forbes [*cf. loc. cit.*].

BHC (benzene hexachloride) in a dust containing 2 per cent. γ isomer gave 77–92 per cent. control of the first generation, but a dust containing 1 per cent. γ isomer averaged only 58 per cent. control. Neither 2 nor 3 per cent. γ BHC applied three times at intervals of ten days was as effective as 2 per cent. applied at the regular intervals. Applications of 3¼ lb. wettable BHC powder containing 6 per cent. γ isomer in 80 U.S. gals. water per acre gave 97 per cent. control of the first generation in a test in which cryolite gave 90 per cent. A dust containing 2 per cent. γ BHC gave slightly better control of the third and fourth generations in summer-planted cane and slightly less of the second generation than cryolite. When applied by aeroplane against the first generation, 2 per cent. γ BHC gave somewhat better control than cryolite applied from the ground, but resulted in 28 per cent. higher infestation at harvest and 112 lb. less sugar per acre. In a similar experiment against the second generation, it again gave somewhat better control, but resulted in equal infestation at harvest and a yield of 303 lb. less sugar per acre. Plots dusted with BHC had a much lower infestation by *S. flava* than cryolite plots and about the same as those dusted with chlorinated camphene [toxaphene],

but field counts indicated that *Diatraea* increased more rapidly on large areas treated with BHC than on those treated with cryolite, and laboratory tests indicated that emergence of *Trichogramma minutum*, Ril., and parasitism of *Diatraea* eggs were reduced by BHC.

A dust containing 10 per cent. toxaphene gave 78–92 per cent. control of the first generation, whereas dusts containing 7 per cent. toxaphene, applied at the regular intervals, and 10 per cent. applied three times at intervals of ten days, gave less control than cryolite ; 15 per cent. toxaphene applied three times gave about equal control. Applications of 4 lb. 25 per cent. wettable toxaphene in 80 U.S. gals. water per acre gave somewhat better control than cryolite. The 10 per cent. toxaphene dust gave only 24 and 70 per cent. control of the third and fourth generations, but the 20 per cent. dust was about as effective as cryolite ; 10 per cent. toxaphene gave 38–74 per cent. control of the second generation. In aeroplane-dusting tests against the first generation, 10 per cent. toxaphene gave about the same initial and harvest-time control as cryolite from the ground, but lower yields ; against the second generation, it resulted in 14 per cent. less immediate control and 24 per cent. less at harvest than cryolite, but in average yields of 73 lb. more sugar per acre. It caused a great reduction of *S. flava* and *Carolinaia* (*Hysteroneura*) *setariae*, Thos., and a smaller reduction of *Pseudococcus boninsis*, Kuw., as compared with no treatment, whereas cryolite increased the infestation by all three, particularly the first.

Dusts containing 2 and 1 per cent. parathion gave only 5 and 1 per cent. control of the third generation on tall cane. The 2 per cent. dust caused a slight increase in infestation by the third and fourth generations in summer-planted cane in one experiment, and 52 per cent. control as compared with 89 per cent. for cryolite and 20 per cent. for 1 per cent. parathion in another. In laboratory tests, parathion decreased the emergence of *Trichogramma* and egg-parasitism. A dust containing 5 per cent. 3,4–dichlorbenzenesulphone p-nitroanilide gave only 23 per cent. control of the first generation. Dusting with sulphur caused an increase in borer infestation, and a dust containing 10 per cent. 2,4-D [2,4-dichlorphenoxyacetic acid] apparently caused slight decreases in infestation in the absence of *Trichogramma* but 58 per cent. increase in infestation by the second generation in the presence of heavy parasitism [*cf.* **37** 256].

GALLAWAY (H. E.). *Melanoplus occidentalis occidentalis* **a Range Species of Grasshopper in Nevada.**—*J. econ. Ent.* **41** no. 6 pp. 925–927. Menasha, Wis., 1948.

Melanoplus occidentalis occidentalis, Thos., which has usually been considered to be a solitary grasshopper, has developed migratory habits and become of economic importance in Nevada in the last ten years [*cf. R.A.E.*, A **40** 171]. The author gives a short description of the adults and describes its life-history and habits. The eggs hatch about 1st April, and the nymphs begin to migrate during the early instars. Practically all have transformed to adults by the third week in May, and oviposition begins in 2–3 weeks and continues until late July, when very few adults are still present. Oviposition begins at about 8.30 a.m., when the air temperature approaches 80°F., and continues until about noon, when the temperature is usually about 92°F. The number of eggs per pod averaged 20 in June and 16 in early July. Feeding takes place mainly in the morning at temperatures of 68–85°F., but has been observed at temperatures of 50 and 92°. The hoppers spend the night in vegetation and begin to move about and feed as the temperature approaches 60°. Range vegetation is chiefly attacked, and species of *Artemisia, Chrysothamnus, Purshia, Lupinus, Astragalus, Carex, Poa, Bromus, Rumex, Balsamorrhiza,*

Eurotia, *Oryzopsis* and *Erodium* suffer the heaviest damage, which is principally by defoliation, often total, or by decortication. In addition to mature plants, many annual and perennial seedlings are destroyed during early spring. This grasshopper has not invaded grain fields, but has caused some damage to lucerne and sweet clover [*Melilotus*] and has completely destroyed various garden crops. The adults often rest in bushes during the heat of the day, when most decortication takes place, presumably for the sake of moisture from the plant.

The adults migrate by short and long flights. These are generally across the prevailing wind, which is westerly in this region, but are influenced by local cross-currents produced by the terrain. Flights usually begin in the morning when the air temperature has reached 80°F. and the morning feeding is over, but flying ceases if the wind velocity is greater than 15 miles per hour. The infestation has spread and moved in a north-westerly direction from the first infestation, which covered an area of 6 sq. miles in Big Smoky Valley, Nye County, and was discovered in 1939. Egg beds of approximately 155,000 acres were observed in 1947 in northern Washoe and north-western Pershing and Humboldt counties, the present infested areas. During 1939, arsenical baits killed an average of 95–98 per cent. of the nymphs, and since then good kills of young nymphs have been obtained with baits of sodium fluosilicate and bran. Attempts to control the adults with poison bait have proved unsuccessful, owing partly to their migratory habits, but in preliminary tests, some of the new insecticides gave fair kills, apparently by contact action.

Blanchard (R. A.) & Chamberlin (T. R.). **Tests of Insecticides, including DDT, against the Corn Earworm and the Fall Armyworm in Corn.**—*J. econ. Ent.* **41** no. 6 pp. 928–935, 3 refs. Menasha, Wis., 1948.

The results are given of experiments carried out in Illinois, Mississippi and Arkansas in 1944–47 to test some of the newer insecticides and different methods of applying them for the control of *Heliothis armigera*, Hb., in market and canning sweet maize and in dent maize grown for seed. In 1945–46, data were also obtained on *Laphygma frugiperda*, S. & A. Some of the results have already been noticed from an earlier account [*cf. R.A.E.*, A **36** 157–158]. The following is based on the authors' discussion and summary.

Of the 16 insecticides tested, DDT, BHC (benzene hexachloride), chlordan and DDD (TDE) were superior to pyrethrins, dichlorethyl ether or styrene dibromide when applied as sprays to maize ears or injected into them in oil solutions or emulsions for the control of *H. armigera* and *L. frugiperda*. BHC made the maize inedible, however, and maize treated with emulsions containing chlordan or with formulations containing kerosene also had a noticeable odour when harvested. Mineral-oil or kerosene solutions were somewhat more effective than any of the emulsions used in the tests reported, though later tests showed better control from DDT in certain emulsions than in oil solutions. *L. frugiperda* appeared to be much more easily controlled than *H. armigera*, possibly because of its more roving habits.

None of the insecticides gave satisfactory control when applied as dusts, in water suspensions or in emulsions containing very small percentages of oil. Two treatments with dusts containing 5–10 per cent. DDT applied one day apart to ears with fresh silks did not give good control. At least 20 per cent. of oil seemed to be required for consistently good control, but it is considered that this acted mainly as a penetrant and might possibly be replaced by some other material. A sodium sulphate of a higher secondary alcohol tested in 1947 greatly increased the rate of control obtained with an emulsion containing only 5 per cent. oil, but the penetrant itself caused severe scorching at the

rate used. Emulsions containing 20–30 per cent. white mineral oil with DDT were atomised on unfertilised silks in considerable quantities, with little loss of tip kernels.

If all the ears were in silk at the time of the first treatment, another application was unnecessary. The duration of the silking period within a field might determine the number of treatments required, but in these tests good control of the larvae was obtained and material injury by them was prevented when the first application was 7–8 days after the first silks appeared. In many fields this would allow good control of both insects with a single application.

Heavy rainfall soon after the application of DDT in oil solutions, emulsions containing oil or water suspensions increased rather than decreased the amount of control secured. The presence of adequate moisture apparently increased the penetration of the insecticide into the silk channels.

The results of these experiments indicate that 14–19 gm. technical DDT per U.S. gal. mineral oil (viscosity 120–125 Saybolt) injected into the silk mass at the rate of 0·33 ml. per ear, 70 gm. technical DDT per U.S. gal. mineral oil (viscosity 80–95) applied as an atomised spray at 0·5–1 ml. per ear, and 140 gm. 50 per cent. DDT dispersible powder with 19 ml. emulsifier (Triton B1956), 1 U.S. quart white mineral oil (120–125 secs.) and water to make 1 U.S. gal., applied as an atomised spray at 2–3 ml. per ear, all give excellent protection against both insects attacking the ears of hybrid seed maize or sweet maize grown for market or canning. When used at these dosages, the treatments do not leave dangerous residues or a disagreeable flavour on the kernels or reduce germination. The same formulations and dosages are recommended for either sweet or field maize, but when the two atomised sprays are used, the husks, leaves and stalks should not be fed to dairy animals or to meat animals that are being finished for slaughter, because of the excessive residues of DDT likely to be present on them.

Successful large-scale application of DDT and other insecticides would seem to depend on the development of suitable power-driven spray apparatus. To reduce both the residue hazard and costs and increase efficiency, a machine dispersing a fine mist seems to be necessary. The droplets should be small enough to float momentarily among the maize foliage but not be too greatly influenced by a moderate breeze. These tests indicate, however, that the spray must be directed towards the silks to obtain adequate coverage of them and penetration of the silk channels.

PAGÁN (C.). **The Use of Guppies in the toxicological Assay of** *Derris* **and** *Lonchocarpus* **Roots.**—*J. econ. Ent.* **41** no. 6 pp. 942–945, 1 fig., 7 refs. Menasha, Wis., 1948.

The author describes a simple laboratory method for assaying the toxicity of *Derris* and *Lonchocarpus* (cubé) roots in which guppies (*Lebistes reticulatus*) are used as test animals. When acetone solutions containing 0·025–0·1 mg. rotenone per ml. were added to water at the rate of 1 ml. per litre, and ten adult male guppies, collected from ponds and ditches at one place in Porto Rico were allowed to remain in it for six hours, after which the numbers of dead were counted, the mortality was proportional to the concentration of rotenone, and plotting the logarithm of rotenone concentration against mortality probits resulted in a straight line. It was found that susceptibility differed for fish collected from different places and at different times of year, and it is therefore suggested that preliminary tests should be made to determine a suitable range of concentration of the toxicant before using the unknown samples.

The method was used to test the toxicity (rotenone equivalent) of root samples of *Derris elliptica* and species of *Lonchocarpus*, by extracting the roots with acetone and diluting the solutions to contain 0·025 mg. rotenone per ml. These were compared with standard solutions containing 0·025, 0·0375, 0·05 and 0·1 mg. rotenone per ml. acetone and with pure acetone. The samples had previously been tested for toxicity against adults of *Musca domestica*, L., and the agreement between the two sets of data (which are given in a table) was very close. Moreover, it has been shown that toxicological data obtained with house-flies are in good agreement with data obtained with the Mexican bean beetle [*Epilachna varivestis*, Muls.], and it therefore seems valid to substitute guppies as a test animal in the biological assay of derris and cubé.

Gaines (J. C.) & Dean (H. A.). **Comparison of Insecticide Dusts for Grasshopper Control.**—*J. econ. Ent.* **41** no. 6 pp. 945–948, 2 figs., 1 ref. Menasha, Wis., 1948.

Tests carried out in Texas in 1947 indicated that dusts of chlorinated camphene [toxaphene], BHC (benzene hexachloride) and chlordan are more effective against grasshoppers than poison baits [*cf. R.A.E.*, A **37** 297]. When used to protect cultivated crops, they gave satisfactory control, even of large nymphs and adults, though high dosages were necessary for this. Large populations of grasshoppers survived the baiting operations in 1947, and as it was evident in the spring of 1948 that excessive numbers of hoppers would hatch in practically all weed fields and pastures, these were dusted soon after hatching was complete, with excellent results in most cases. Thousands of acres of pasture were dusted with toxaphene without removing the livestock, and no injury to animals was reported.

In this paper, the author gives the results of cage and field tests carried out in the spring of 1948. Mixed populations of grasshoppers occurred, but the majority were *Melanoplus differentialis*, Thos., and this species was used in all cage tests. Hatching was complete by early May, when the first field tests were begun. In cage tests in which field-collected nymphs were dusted and transferred to clean cages, the median lethal dosages of 10 per cent. toxaphene in 75 per cent. sulphur, 10 per cent. chlordan in 80 per cent. sulphur, 2 per cent. parathion in an inert diluent and 3 per cent. γ BHC in 50 per cent. sulphur were 17·3, 14·9, 8·4 and 5·5 lb. per acre, respectively. When field-collected nymphs were caged with cotton plants dusted with the same materials at 16 lb. per acre, parathion and BHC killed nearly 80 per cent. within 48 hours, while toxaphene and chlordan acted rather more slowly.

In field tests, the same dusts were applied at about 10–20 lb. per acre early in the morning while the air was calm and dew was present, so that the insecticides acted both as contact and stomach poisons. The initial population averaged approximately 400 nymphs per 50 sweeps, and the results indicated that the four dusts were about equally effective against the first and second instars, giving 90–100 per cent. kill after about a fortnight. All dusts needed to be applied at the rate of at least 10 lb. per acre, mortality being low on plots receiving lower dosages. Later, during June, large nymphs and adults migrated from weed fields and pastures to cultivated crops. These crops were successfully protected by dusting, but it was necessary to apply 2–3 lb. technical toxaphene or chlordan per acre. For a quick kill, high dosages of either BHC or parathion were used.

Dills (L. E.) & Odland (M. L.). **Cabbage Caterpillar Insecticide Tests.**—*J. econ. Ent.* **41** no. 6 pp. 948–950, 4 refs. Menasha, Wis., 1948.

The most important leaf-eating insects on cabbage and similar crops in Pennsylvania are *Pieris rapae*, L., and *Trichoplusia ni*, Hb. The former is

usually the more abundant during early summer and the latter during late summer and early autumn, but in September 1946 the infestation consisted of 79·1 per cent. *P. rapae* and 20·9 per cent. *T. ni*. In September 1947 it consisted of 7·6 per cent. *P. rapae* and 92·4 per cent. *T. ni*, though observations indicated that *P. rapae* had been the more abundant earlier in the season. In these two years, 14 insecticides, including two forms of BHC (benzene hexachloride) were tested as dusts in pyrophyllite for the control of the two insects. The BHC dust used in 1946 contained 0·38 per cent. γ isomer and 2·78 per cent. other isomers; that used in 1947 contained 1 per cent. technically pure γ isomer. The cubé dust used in both years contained 0·75 per cent. rotenone. In 1946, six applications were made at intervals of slightly more than a week, and in 1947 three applications were made at intervals of 2–3 weeks. The plants were examined for feeding injury in early September, and yield records were taken in late October. When the feeding injury was taken as an indication of degree of control, no feeding injury being rated as 100 per cent. control and the amount in the untreated plots as 0, dusts containing 1, 2 and 3 per cent. DDT gave more than 80 per cent. control in both years. In 1947, 3 per cent. DDD (dichlordiphenyldichlorethane) was about as effective as 2–3 per cent. DDT (87 per cent. control) [*cf. R.A.E.*, A **35** 253], 3 per cent. chlorinated camphene [toxaphene] was slightly less effective, and 3 per cent. methoxy-DDT (methoxychlor) and 3 per cent. chlordan significantly less so. In 1946, when *P. rapae* predominated and applications were more frequent, the BHC and cubé dusts and 30 per cent. *Ryania* gave 84·2, 85·8 and 83·1 per cent. control, respectively, whereas in 1947 BHC, cubé and 40 per cent. *Ryania* gave only 62·7, 35·5 and 46 per cent. control; 10 per cent. sabadilla, tested in 1946 only, gave 84·5 per cent. A dust containing 20 per cent. of a proprietary pyrethrum dust having 2·5 per cent. piperonyl cyclonene (piperonyl cyclohexenone) and 0·2 per cent. pyrethrins gave 78·6 per cent. control and 20 per cent. lead arsenate 77·6 per cent. in 1946, and neither was significantly less effective than DDT. Dusts containing 20 per cent. zinc fluoarsenate, 20 per cent. calcium arsenate or 10 per cent. 2-mercapto-6-nitrobenzothiazole gave practically no control.

The yield records were not considered so reliable as the feeding records, owing to disease, but tended to corroborate these. In 1946, 3 per cent. DDT gave insignificantly higher yields than some of the other treatments and significantly higher yields than no treatment. In 1947, all treatments gave significantly higher yields than none, but there were no significant differences between plots treated with BHC, chlordan, toxaphene, DDD or 3 or 1 per cent. DDT.

SMITH (F. F.). **DDT and other Synthetics for Control of Gladiolus Thrips.**—*J. econ. Ent.* **41** no. 6 pp. 955–959, 14 refs. Menasha, Wis., 1948.

The following is based on the author's summary. Experiments were carried out in the United States in 1947 to compare DDT and several of the newer insecticides, applied as dusts, an aerosol or sprays, with sprays of tartar emetic and sugar, for the control of *Taeniothrips simplex*, Morison, on small field plots of *Gladiolus*. After six weekly applications of each insecticide, large proportions of the flowers were free of thrips injury for two weeks, but less of the later ones were clean. In dusting experiments, the percentages of flowers free from injury were 82–90 on plots treated with 5 per cent. DDT, 1 per cent. γ BHC (benzene hexachloride), 0·5 per cent. parathion or 5 per cent. chlorinated camphene [toxaphene], 53 in plots treated with an impregnated dust containing 1 per cent. DDT, and 4 in untreated plots. In plots treated with an aerosol from a mixture of 5 per cent. each of DDT, cyclohexanone and methylated naphthalenes, 35 per cent. acetone and 50 per cent. methyl chloride, 96 per cent. of the flowers were uninjured.

In tests with sprays (in which the concentrations given are per 100 U.S. gals), the percentages of uninjured flowers were 86–95 for 1–2 lb. 50 per cent. wettable DDT powder or 0·2 lb. γ BHC in a wettable powder or for emulsions containing 0·5 lb. DDT, chlordan or toxaphene or 0·1 lb. γ BHC, 75 for 1 U.S. pint. 50 per cent. hexaethyl tetraphosphate, 80 for 2 lb. tartar emetic with 4 lb. sugar, and 0 for no treatment.

In tests with 5 per cent. DDT dust applied to stored corms, a surface application of 0·5 oz. to a bushel of corms in a tray shortly after harvest gave protection from thrips attack throughout the winter. Applications in midwinter, before the infestation became severe, also gave good protection, but some thrips survived until spring. Applications in March, when the population had increased, were less effective, since the thrips had become established on the corms beneath the scales. Control of thrips by applications of dust to the surface layer after the trays were filled was equal to that obtained by more thorough distribution of the dust in trays or by shaking corms and dust in bags. DDT did not act as a fumigant against the thrips beneath the scales, and a dip or fumigant should be used for a more complete disinfestation before planting.

Smith (R. F.), MacSwain (J. W.), Linsley (E. G.) & Platt (F. R.). **The Effect of DDT Dusting on Honeybees.**—*J. econ. Ent.* **41** no. 6 pp. 960–971, 5 figs., 21 refs. Menasha, Wis., 1948.

The following is virtually the authors' summary. The effects of DDT dusts on honey bees were studied in 1947 in an area two miles square near Blythe, California, containing a limited acreage of pollen and nectar sources and in which the honey-bee population was controlled. Techniques for measuring these effects are discussed. It was shown by marking that most of the bees from the experimental hives were visiting one lucerne seed field, and also that the majority of the bees in this field were from the experimental colonies. The field was dusted three times with 30 lb. 5 per cent. DDT dust per acre per application, and it was demonstrated that such dusting of lucerne in bloom has a detrimental effect on the production and activity of honey bees. Although this effect is definite, it is small and is more than offset by the increased nectar flow when *Lygus* bugs are controlled. The marked decline in bee populations in a dusted field immediately after treatment would seem to be largely due to repellent action of DDT dusts [*cf. R.A.E.*, A **37** 148]. Even though the effect on the bees is not great, dusting of lucerne in bloom should be restricted to the essential minimum and should be done only in the early morning before the bees are active.

Anderson (R. F.). **Relation of Droplet Size to Toxicity in Residual-type DDT-Oil Sprays.**—*J. econ. Ent.* **41** no. 6 pp. 974–976, 2 refs. Menasha, Wis., 1948.

When insecticides are applied as sprays from aeroplanes, much of the material may be lost by drifting. This loss may be reduced by increasing the size of the particles so that they will be less affected by wind and air currents, but as an increase in droplet size may change the effectiveness of the insecticide, laboratory tests were carried out to determine the relation of droplet size to toxicity in residual-type sprays of DDT in oil. Technical DDT was dissolved in xylene and fuel oil No. 2 in the early tests and in an alkylated naphthalene fraction in the later ones. Droplets of uniform size were made by momentarily touching the inner bottom surfaces of petri-dish test chambers with the tip of a fine-pointed pipette, the size being altered by varying the size of the pipette openings. Tests against *Drosophila melanogaster*, Mg., showed that the toxicity of a given amount of DDT varied inversely with droplet size and that its effectiveness

was also increased when its dispersion was improved by using more dilute solutions and consequently a larger number of droplets.

King (H. L.), Hutson (R.) & Farr (T. H.). **The Control of Red-banded Leaf Roller with Parathion.**—*J. econ. Ent.* **41** no. 6 pp. 976–977, 2 refs. Menasha, Wis., 1948.

Parathion wettable powders were compared in 1947 with lead arsenate and DDT against *Eulia* (*Argyrotaenia*) *velutinana*, Wlk., on apple in Michigan, where this Tortricid has recently become a major pest [*cf. R.A.E.*, A **37** 381; **38** 57]. Standard uniform treatments of wettable sulphur and lead arsenate were applied at the beginning of the season, and the test materials were applied four times at intervals of a fortnight from the second cover spray on 27th June; wettable sulphur was used on all plots on the first two dates, but no fungicide was used on the last two. All spray quantities are given per 100 U.S. gals. The percentages of fruits injured by the larvae at harvest and (in brackets) the yield in bushels per tree were 0·2 (6·5) for 4 lb. 15 per cent. parathion, 0·2 (7·5) for 2·5 lb. 25 per cent. parathion, 0·5 (8·7) for 1·75 lb. 15 per cent. parathion, 0·5 (7·8) for 1 lb. 25 per cent. parathion, 0·3 (8·7) for 3 lb. lead arsenate, 2·5 (8·7) for 1·5 lb. 50 per cent. DDT and 3·3 (8·9) in the controls. A difference of 0·8 per cent. was highly significant. Residues of parathion in parts per million on the fruits before and after the last cover spray and three weeks later were 0·3, 3·1 and 0·15 for the first of these sprays, 0·6, 3·4 and 0·19 for the second, 0·1, 1·2 and 0·12 for the third, and 0·4, 1·3 and 0·07 for the fourth. Equivalent dosages of 15 and 25 per cent. parathion mixed equally well in the tank, were equally easy to spray and gave practically identical results. The yield records indicated no stimulation or retardation in crop development due to spraying, and there was no spray injury.

O'Neal (E. J.) & Fluke (C.L.). **Tests with DDT against active Nymphs of Oyster Shell Scale.**—*J. econ. Ent.* **41** no. 6 pp. 978–979. Menasha, Wis., 1948.

Lepidosaphes ulmi, L., has become increasingly injurious on apple in Wisconsin in the last few years and in extreme cases has killed the trees. In 1946 and 1947, dormant oils did not give satisfactory control. The percentage of living scales was higher and the percentage parasitised lower on treated than on untreated trees and on trees treated in both years than on those treated only once. These results suggested that the continued use of dormant oils for scale control would reduce the percentage parasitism and so increase the proportion of living scales.

Since the dormant sprays failed to give control, several post-dormant spray treatments were tested. In 1946, they were applied on 14th–15th June, after blossoming, when the eggs had hatched and crawlers were present. The trees were covered from the ground up and each was treated from both sides with about 13 U.S. gals. spray. Counts of scales on 40 twigs, made between 28th July and 12th August, showed 7 for 2 lb. 50 per cent. DDT per 100 U.S. gals., 39 for nicotine sulphate (1 : 800) with 1 per cent. summer oil, 174 and 194 for two other sprays containing DDT treatments, 235 for 2 lb. 50 per cent. DDD (dichlor-diphenyldichlorethane) per 100 U.S. gals. and 292 for 0·5 per cent. of a concentrate containing 5·7 per cent. soluble nicotine and 91·3 per cent. oil. Sprays of 2 lb. 50 per cent. methoxy-DDT (methoxychlor) or 50 per cent. BHC (benzene hexachloride) per 100 U.S. gals. or of lime-sulphur with 3 lb. lead arsenate per 100 U.S. gals. or with nicotine sulphate (1 : 400) resulted in more than 1,400 scales per 40 twigs. Some scorching from the spray containing 1 per cent. summer oil was evident, and it is pointed out that summer oils cannot be used on apple in Wisconsin, owing to the continued application of sulphur fungicides before and after blossoming.

In 1947, two applications of 2 lb. 50 per cent. DDT per 100 U.S. gals., made when the eggs had hatched and the young were beginning to crawl, were compared with a full-season spray schedule of 3 lb. lead arsenate per 100 U.S. gals. in four orchards in different counties ; two applications were made because of the prolonged hatching period. In August, the percentages of twigs infested were 9 in the two orchards sprayed with DDT and 72 and 79 in those sprayed with lead arsenate, and the infestation per twig was much lighter in the orchards that received DDT than in those that did not.

CHAMBERLIN (F. S.) & TIPPINS (H. H.). *Microtheca ochroloma*, **an introduced Pest of Crucifers, found in Alabama.**—*J. econ. Ent.* **41** no. 6 pp. 979–980. Menasha, Wis., 1948.

Small beetles collected on young cabbage plants in Alabama on 20th March 1947 were identified as *Microtheca ochroloma*, Stål, a Chrysomelid that is said to be a serious pest of crucifers in Argentina and Uruguay and had been intercepted at New Orleans on grapes from Argentina in 1945. A survey made in early April 1947 showed it to be well distributed over an area extending for several miles round Mobile, where it was found feeding on cabbage, collards, mustard, turnip and radish. Infestations occurred principally on garden plantings, and nearly all the serious ones were on turnip, which appears to be the preferred food-plant, although large populations were observed occasionally on mustard and collards. A heavy application of 0·75 per cent. rotenone dust apparently eliminated all the adults and small larvae in the first infestation observed, and it appeared that the beetles may have been compelled to feed on cabbage in this instance by the absence of other food, since no other infestations of any consequence were found on cabbage. The beetles were abundant on small turnip plantings near Theodore, but caused no injury to large plantings of commercial cabbage in that district, and young tender cabbage plants adjacent to heavily infested turnips in one field showed no evidence of feeding.

The adults made small irregularly shaped holes in the leaves and fed on the leaf margins, and feeding by the larvae on turnip and radish leaves resembled that by the Colorado potato beetle [*Leptinotarsa decemlineata*, Say] on potato. The larvae frequently fed in groups, and when abundant consumed large portions of the foliage. *Microtheca* was not observed feeding on the stems or roots of plants. Many of the adults observed during early April were thought to have just emerged from hibernation, but others had evidently been active for some time, since numerous larvae and a few pupae were present. Adults caged on 9th April deposited large numbers of eggs immediately after capture. Limited observations indicated that the species aestivates during the hot summer months.

A field survey revealed additional infestations 25 miles north-west and 18 miles east of Mobile, and a single adult in a clump of sedge grass was taken 35 miles south-east of Mobile. No infestations were found in New York, California or elsewhere in the Southern States.

RICHARDSON (H. H.). **Present Status of the Citrus Blackfly and its Parasite *Eretmocerus serius* at Nassau, Bahamas.**—*J. econ. Ent.* **41** no. 6 p. 980, 1 ref. Menasha, Wis., 1948.

Heavy infestations of *Aleurocanthus woglumi*, Ashby, on *Citrus* were reported at Nassau in 1931, when *Eretmocerus serius*, Silv., was introduced against it [*cf. R.A.E.*, A **21** 189], and observations in 1937 indicated that the Aleurodid was still abundant in some groves, although the parasite was also abundant. It was therefore decided to introduce the Coccinellid, *Catana clauseni*, Chapin, which had previously been imported from Malaya into Cuba where it had

been shown to be capable of controlling heavy infestations, and over 1,000 adults and larvae from Cuba were released at Nassau. Both these stages feed mainly on the eggs and first-instar nymphs of *A. woglumi*. It is not known whether the Coccinellid became established, but observations in 1947 in five *Citrus* groves and two home plantings showed that *A. woglumi* was very scarce [*cf.* **29** 293]. Only 99 leaves of approximately 80,000 examined on 161 trees were infested, and these usually bore only one colony of 10–20 or more immature Aleurodids ; no adults were observed. Of 1,983 nymphs examined, 32 per cent. were parasitised by *E. serius* ; only one adult parasite was found. Actual figures for mortality due to parasitism are doubtless higher than this.

It is concluded that *A. woglumi* is now well controlled at Nassau, apparently by *E. serius*, possibly aided by *C. clauseni*.

HOVANITZ (W.). **Change of Host Preference in** *Colias philodice*.—*J. econ. Ent.* **41** no. 6 pp. 980–981, 2 refs. Menasha, Wis., 1948.

Colias philodice, Godt., is distributed over the United States and Canada, east of a narrow belt on the Pacific coast, on various leguminous plants, especially clover. Over most of its habitat, lucerne does not seem to be an attractive food-plant ; in areas in the Great Lake States where the two crops are grown in adjacent fields, *C. philodice* is mainly attracted to clover and *C. eurytheme*, Boisd., to lucerne. In the upper Arkansas River Valley of Colorado, however, *C. philodice hageni*, Edw., was observed in August 1948 to be abundant on lucerne. The leaves were severely eaten, eggs and larvae were very numerous, and it seems certain that the larvae are able to develop on lucerne in this area, though they do not do so regularly either further west, in Arizona and California, or further east, in the lower parts of the Mississippi Valley and on the eastern seaboard. Both *C. philodice* and *C. eurytheme* are present on the lucerne in the upper Arkansas Valley, but the latter species is relatively scarce there. At Las Animas, Colorado, only three of 230 females of *Colias* counted in one lucerne field were *C. eurytheme*. Westward from there to the foot of the Rockies, *C. philodice* was the primary species observed on lucerne, but eastwards, *C. eurytheme* gradually became commoner ; 60 miles to the east, 47 of 118 males were *C. eurytheme*, and still further east, at O'Neill, Nebraska, 48 of 51 females were *C. eurytheme*.

This change of food-plant specificity illustrated that a given species of insect may alter its food-plant requirements for either geographical or physiological reasons. The subspecific difference of the population of *C. philodice* in Colorado from that of the Mississippi Valley or the west coast is an indication of hereditary differences in visible characters. That these characters are antedated by physiological differences in growth should probably be recognised, and the differences may be related to the differences in food-plant specificity. Other factors must be taken into consideration. The climate of the high plains (upper Arkansas River Valley) differs considerably from that of the lower Mississippi Valley, being cooler and drier in summer, and such a difference may be sufficient to alter the dietary requirements of the insect directly, though this seems unlikely. Also, the strain of lucerne grown in the high plains is itself quite possibly different from that used in the Mississippi Valley or on the eastern seaboard, so that a change in content of the plant rather than a change in the requirements of the insect may have occurred.

OMAN (P. W.). **A Leafhopper injurious to cultivated Prune in the western United States.**—*J. econ. Ent.* **41** no. 6 p. 983, 1 ref. Menasha, Wis., 1948.

Specimens of *Typhlocyba* collected from cultivated prunes in the western United States during 1944–48 consisted mostly of *T. prunicola*, Edw., though a

few of *T. rosae*, L., occurred. Since *T. prunicola* appears to be becoming more widely distributed and more important as a pest, the author summarises information on its distribution and synonymy. It has been recorded from England, France and Sweden and has been identified by the author from prune or plum in California, Idaho, Oregon, Utah and Washington. It is presumed to have been introduced into the United States. Its synonyms include *T. pruniella*, DeL. (*T. pruni*, DeL. & Dav. [*cf. R.A.E.*, A **22** 527] nec Edw.).

HOUGH (W. S.). **Chlordan compared with Parathion on Plums.**—*J. econ. Ent.* **41** no. 6 pp. 983–984. Menasha, Wis., 1948.

In 1948, old neglected damson-plum trees of the French type along the edge of an orchard in Virginia were sprayed with wettable powders containing parathion or chlordan for the control of the plum curculio [*Conotrachelus nenuphar*, Hbst.]. The percentages of fruits damaged were 57·3 on untreated trees, 2·5 on trees receiving 2 lb. 25 per cent. parathion per 100 U.S. gals. in the late bloom, petal-fall, shuck-fall and first cover sprays (16th and 23rd April and 1st and 11th May), 0·8 for those receiving these treatments and an additional one on 21st May, and 2·9 on those receiving 2 lb. 40 per cent. chlordan on 16th April and 2·5 lb. on 23rd April and 1st and 11th May. Observations made during the week after 16th April indicated that the first application could probably have been omitted without affecting the results. From late June until harvest, an elemental sulphur fungicide was applied to all trees at weekly intervals to control brown rot [*Sclerotinia*]. The chlordan spray caused severe defoliation in May and killed the terminal buds, after which no new leaves developed ; it resulted in plums scarcely half the normal size at harvest, though it caused no fruit drop or surface injury to the fruits. Trees sprayed with parathion showed no evidence of spray injury and all bore a heavy crop. Parathion residues on 7th June, when the fruits were about half grown, were 0·08 and 0·4 parts per million after four and five applications, respectively, and 0·02 p.p.m. on unsprayed fruit. At harvest (22nd July), the residue was the same on sprayed and unsprayed fruit (0·02 p.p.m.).

MADSEN (H. F.). *Pediculoides ventricosus*, **a predatory Mite attacking the Bud Moth.**—*J. econ. Ent.* **41** no. 6 pp. 984–985, 2 refs. Menasha, Wis., 1948.

In the course of investigations in 1947–48 on *Spilonota ocellana*, Schiff., on prunes in Santa Clara Valley, California, it was observed that the larvae were attacked by *Pediculoides ventricosus*, Newp. The mites fed on the larvae during the late autumn and winter, when they were in a resting stage within their hibernacula, but were not found on them during the summer, when they were active and feeding. Usually a larva was attacked by more than one mite, the greatest number observed in the field being eight. The mites appeared to inject some toxin into the larvae, as laboratory observations showed that the latter died soon after being attacked. Examination of *Spilonota* hibernacula in the field disclosed dead larvae with living mites attached and others that were dry and shrivelled with no mites present ; since no other predators or parasites were found, it is probable that most of the shrivelled larvae had been killed by *Pediculoides*. The percentage of natural mortality, most of which was due to the mite, increased monthly from 33 in October to 56 in January.

It is concluded that *P. ventricosus* may be an important factor in the natural control of *S. ocellana* in the Santa Clara Valley, but further observations are necessary to determine whether such a high proportion of attack is a usual seasonal occurrence.

DeBach (P.). **The Establishment of the Chinese Race of** *Comperiella bifasciata* **on** *Aonidiella aurantii* **in southern California.**—*J. econ. Ent.* **41** no. 6 p. 985, 3 refs. Menasha, Wis., 1948.

Although two million laboratory reared examples of the Chinese race of *Comperiella bifasciata*, How., introduced in 1941 were liberated intensively in 1941–42 in seven counties in California against *Aonidiella aurantii*, Mask., on *Citrus* and first-generation recoveries were fairly common [*cf. R.A.E.*, A **31** 328], the parasite was not known to have become established except on a few trees at Riverside until 1946, when parasitised examples of the Coccid were found to be common there in the grounds of the Citrus Experiment Station. Definite establishment in a locality other than Riverside was first ascertained in January 1948, when *Comperiella* was found to be abundant in a heavily infested lemon grove at Escondido, and subsequent collections showed the parasite to be generally distributed in the Escondido area. Surveys in San Diego, Santa Barbara, Orange, Los Angeles, San Bernardino and Riverside counties in 1948 did not reveal the parasite in other infested groves.

It is possible that only a few of the parasites originally released were genetically constituted to survive under field conditions in southern California, and those recovered may represent a strain superior to the original mixed stock in ability to survive there. Individuals from Riverside are being reared in the insectary for subsequent release in areas now without *Comperiella* in order to ascertain whether this is so. The parasite does not appear to be very effective in the Riverside or Escondido areas; since it generally becomes abundant only when the scale is abundant, it may reduce peak infestations but is not efficient in infestations of low density.

Kulash (W. M.). **New Insecticides for Cotton Insect Control.**—*J. econ. Ent.* **41** no. 6 pp. 986–987. Menasha, Wis., 1948.

In small-plot tests on the control of *Anthonomus grandis*, Say, and *Heliothis armigera*, Hb., on cotton in North Carolina in 1947, dusts containing 20 per cent. chlorinated camphene [toxaphene], 3 per cent. γ BHC (benzene hexachloride) with 5 per cent. DDT, 5 per cent. γ BHC, or 5 per cent. chlordan were applied on 22nd July, after examination on 18th July had shown that an average of 17 per cent. of the squares bore egg-punctures of the weevil, and then not again until 6th August, owing to an intervening drop in the infestation. Further applications were made on 11th, 16th, 19th and 29th August. All dusts were applied between 5 and 7 a.m. with a rotary hand gun at 10 lb. per acre. Square counts made before each application showed no significant reduction in weevil infestation due to any of the insecticides, and examination of bolls on 12th September showed that the percentages infested by *Heliothis* were 2·75 for toxaphene, 6·5 for the mixture of BHC and DDT, 12·5 for 5 per cent. γ BHC, 11·5 for chlordan and 12·5 for no treatment. All treatments resulted in higher yields than none, but there was no consistent relationship between yields and infestation by weevils or bollworms. The highest yield occurred in plots treated with toxaphene, which gave the best control of the bollworm, but the lowest average weevil infestation was in those treated with 5 per cent. γ BHC [*cf. R.A.E.*, A **37** 241].

Breakey (E. P.) & Batchelor (G. S.). **The Willamette Mite, a Pest of Raspberries in the Puyallup Valley.**—*J. econ. Ent.* **41** no. 6 pp. 987–988. Menasha, Wis., 1948.

Tetranychus willamettei, McG., became a serious pest of raspberries in the Puyallup Valley of western Washington in 1947, partly owing to the unwise

use of DDT on this crop against *Tortrix* (*Argyrotaenia*) *citrana*, Fern. [*cf. R.A.E.*, A **38** 25]. Mites were first noted in appreciable numbers at about the beginning of blossom time. The population began to increase on the undersides of the lower leaves, and moved up the canes as the season advanced, so that leaf injury was severe by the middle of summer. It began as a drying or scorching round the leaf margin and later affected the entire leaf.

In tests on control of the mite, two acaricides were applied with insecticides, and the results were assessed by examining the lower surface of a leaf under a binocular microscope and counting the living mites in the microscopic field. This was repeated for 50 leaves taken at random at the same height for each count, and the totals taken as measures of the infestation. Applications of 8 oz. DN–111 (20 per cent. dicyclohexylamine salt of dinitro-o-cyclohexylphenol) per 100 U.S. gals. gave good mite control when combined with 2 lb. DDD (dichlordiphenyldichlorethane) or cryolite (274 and 775 mites after 24 hours and 263 and 1,091 after 48, as compared with 9,693 and 8,135 on untreated leaves) but not when combined with 2 lb. DDT or methoxychlor [methoxy-DDT] (1,258–4,544 mites). Applications of 20 fl. oz. of a product containing 20 per cent. tetraethyl pyrophosphate with 5 per cent. other ethyl phosphates per 100 U.S. gals. were effective when combined with 2 lb. DDD or DDT (396 and 647 mites after 24 hours and 298 and 546 after 48, as compared with 5,347 and 5,302 for no treatment), but not with 2 lb. cryolite or DMT [? methoxy-DDT] (1,201–1,551 mites). The effectiveness of the acaricides when combined with DDD is satisfactory as the inclusion of an acaricide will probably be desirable when spraying against *T. citrana*, and DDD is the most promising of the newer insecticides tested against this Tortricid [*cf. loc. cit.*].

ELMORE (J. C.). **The Control of Darkling Ground Beetles.**—*J. econ. Ent.* **41** no. 6 p. 988, 3 refs. Menasha, Wis., 1948.

Damage to seedling peppers [*Capsicum*] in 1945 was reported in southern California, and in May 1946 Tenebrionids, chiefly *Blapstinus dilatatus*, Lec., were observed damaging pepper seedlings at Talbert, California. The beetles were well distributed over pepper fields that had been planted with beans the year before, but they were also moving from former bean fields into fields sown with peppers, and had cut off 29–46 per cent. of the seedlings just as they broke through the ground in one field. On 8th May, dusts containing 4 per cent. DDT fused with sulphur or 5 or 10 per cent. DDT in pyrophyllite were applied with a hand duster at the rate of 25 lb. per acre. Two days later, practically all the dead beetles found were in the first two rows at the edge of the field that had been treated with DDT and sulphur. This material had apparently acted as a barrier and killed the beetles by contact before they could travel further into the field. On two 25-foot strips of row, 31, 18 and 48 dead beetles and 4, 3 and 5 living ones were collected 2, 6 and 12 days after treatment, respectively. In an 80-acre field of seedling peppers in which beetles were well distributed, only dead ones could be found 24 hours after an application of 5 per cent. DDT in pyrophyllite at 15 lb. per acre with a power duster ; a few live ones were found five days later. In three 25-ft. strips of row in which 36 per cent. of the plants had been destroyed, 62 living beetles were observed before the dust was applied and only seven six days after it. The dead beetles were scattered generally over the area, and had apparently come in contact with the dust by crawling through it.

As a result of these tests, many growers of peppers in Orange and Ventura counties successfully dusted their fields with DDT in pyrophyllite in 1946 and 1947. It was found that most protection was obtained when the dust was applied just before the seedlings broke through the ground.

Peay (W. E.) & Knowlton (G. F.). **Occurrence of Thrips within Tomato Fruits.**—*J. econ. Ent.* **41** no. 6 pp. 989–990, 1 fig., 1 ref. Menasha, Wis., 1948.

During the tomato-canning season of 1941, a cavity containing thrips was found inside a tomato fruit in a factory in Utah, and examination of 691 washed tomatos showed 66 to have cavities that contained or had contained thrips. Examination of several thousand sliced tomatos under a microscope in 1942 showed that about 10 per cent. contained cavities, of which 70 per cent. were open to the blossom end of the fruit. During the canning season that year, many tomatos with catfaces or large stylar scars were selected and others were taken at random from the conveyor belt in the factory. When these were sliced and examined, it was found that 27 per cent. of the selected fruits and 10 per cent. of those taken at random contained cavities capable of harbouring thrips; thus many of the cavities were associated with fruits having large stylar scars.

In 1943–46, green tomatos of all sizes and ripe fruits were taken at weekly intervals, sliced and examined. The species of thrips found in them were *Thrips tabaci*, Lind., and *Frankliniella moultoni*, Hood. The cavities varied in size and shape, but analysis of the results showed that there were as many cavities and open cavities in small fruits as in large ones and in one year as in another. Approximately 71 per cent. of the cavities were open to the blossom end of the fruit and the others had been at some time. Thrips had become sealed in many of the cavities by the closing of the openings, particularly in ripe fruits, and many of them had produced a brood while trapped; one or more adults were found in a closed cavity with as many as 73 nymphs. In a few fruits, the developing tissue had pressed the walls of the cavity together and killed the thrips inside. Analysis of the percentages of cavities containing thrips and the numbers of thrips per 1,000 fruits showed that few thrips occurred in tomatos smaller than 0·5 in. in diameter and that the number of cavities containing thrips increased as the size of the fruit increased. More thrips were found in ripe than in green fruits of the same size, and more were found in 1945 and 1946 than in the other years. Of over 11,000 fruits examined, 18 per cent. contained cavities and 2 per cent. contained thrips. There were twice as many cavities in fruits with catfaces and large stylar scars as in fruits with small blossom ends, and 188 of the 314 cavities containing thrips were open. Of a total of 665 thrips found, about twice as many per cavity were in closed cavities as in open ones.

It is considered that the development of cavities is a natural process accompanying the growth of the fruits. Apparently, the thrips were often trapped during the growth of the tomato, though some adults evidently left after ovipositing, since only nymphs were present in some of the sealed cavities. Several applications of mixtures containing 3, 5 and 10 per cent. DDT caused some reduction in infestation, but DDT and several other insecticides failed to give practical control. The selection of varieties and strains having few cavities seems to offer the best hope of prevention.

Linsley (E. G.). **A Hollyhock Leaf Miner new to North America.**—*J. econ. Ent.* **41** no. 6 p. 990, 3 refs. Menasha, Wis., 1948.

Adults of *Trachys pygmaea*, F., were found on hollyhock leaves at Rutherford, New Jersey, between 6th and 15th June 1948. This Buprestid has previously been recorded only from southern and south-eastern Europe, Asia Minor and North Africa, where it feeds on hollyhock and related plants. Leprieur (1861) stated that in Algeria the eggs are placed singly on the under surface of the

leaf, usually near the edge, beneath a white protective covering about 0·5 mm. in diameter. The larva hatches after a few days and penetrates the leaf epidermis directly beneath its protective covering. It feeds for 15–16 days between the epidermal layers of the leaf, forming an irregular oval mine, and then pupates in a corner of the mine and transforms to the adult stage 8–10 days later.

KNOWLTON (G. F.) & HOUCK (B. B.). **A Nitidulid Beetle infesting Sweet Corn.**—*J. econ. Ent.* **41** no. 6 pp. 990–991, 1 ref. Menasha, Wis., 1948.

Carpophilus lugubris, Murr., has for several years caused injury to the ears of sweet maize in several places in Utah, usually following infestation by the corn earworm [*Heliothis armigera*, Hb.] [*cf. R.A.E.*, A **30** 530], and severe local infestations occurred at Springville in 1946 and 1948. On 23rd July 1948, nearly all ears of sweet maize that were reaching maturity were conspicuously infested in one field. The ears contained 5–34 adults and some more than a hundred larvae each, 1–9 larvae being found in each infested kernel and many small ones between them. In a neighbouring field of slightly later maize, 40 per cent. of the ears were infested, and there was no sign of injury by *H. armigera* in about 25 per cent. of these. It is thought that either large numbers of the adults had matured in earlier maize infested by *H. armigera* and then moved to later maize in the vicinity, or adults breeding in the area had accumulated in such ears and deposited eggs from which the later infestation arose. Adults were usually present with the larvae. Such frequent occurrence of Nitidulid infestation in ears showing no damage by *H. armigera* or other predisposing cause indicates that at times of great local abundance, this species may become a primary pest of sweet maize.

MAEHLER (K. L.). **The Oriental Fruit Fly in Guam.**—*J. econ. Ent.* **41** no. 6 pp. 991–992, 3 refs. Menasha, Wis., 1948.

Although *Dacus ferrugineus dorsalis*, Hend., the habits of which are briefly described, could not be found in Guam in surveys up to October 1947, it was considered likely to occur there, since it was known to be present in Saipan and intervening islands and had spread to Hawaii [*R.A.E.*, A **36** 249]. Attempts were therefore begun to examine possible host fruits for infestation and to trap adult flies by means of citronella bait, which had proved attractive to the males in Saipan. In December 1947, a few larvae were obtained from overripe bananas, but though the presence of the fruit-fly was thus confirmed, it was not at all numerous. Attempts to determine whether this was due to interruptions in the availability of host-fruits showed that in December, breadfruit (*Artocarpus communis*) were just coming into season, and although a few trees might occasionally produce fruits out of season, there was no sustained supply. Bananas and papayas occurred throughout the island but seldom bore ripe fruits, and there were practically no guavas, which are the main host fruits on Oahu. Later, when adults were taken in traps in the Talofofo area, it was found that they were developing in fruits of custard apple (*Annona reticulata*), which was growing in a semi-cultivated condition along a road. It is considered that an increase in the fly should be expected during the breadfruit season, unless it is being controlled by some parasite. It is recommended that fruit from the northern Marianas (Saipan, Tinian and Rota) should now be allowed to enter Guam, but that shipments of fruit should be prohibited from these islands and Guam to other parts of the Trust Territory, where the fly is not known to occur. A list is appended of upwards of 50 host-fruits that it has been found to infect in Hawaii.

Hatch (M. H.) & Tanasse (C.). **The Liberation of *Hippodamia convergens* in the Yakima Valley of Washington, 1943 to 1946.**—*J. econ. Ent.* **41** no. 6 p. 993, 4 refs. Menasha, Wis., 1948.

The practice of collecting hibernating masses of *Hippodamia convergens*, Guér., in the mountains and transporting them to market gardens for the control of Aphids was begun in California in 1910 and shown to be ineffective in 1919 [*cf. R.A.E.*, A **7** 198; **13** 24; **27** 30]. Despite this, it was continued to some extent by growers in California and Washington, and during the second world war, when hop growers in the Yakima Valley could not obtain nicotine spray, they again secured supplies of *H. convergens* from California and distributed them, partly as a communal project. With the passing of war conditions, reliance on insecticides was re-established, and no extensive importation of beetles was reported in 1947. The matter is of interest in showing the persistence of a scientifically unjustified attempt at biological control 20 years after it was discredited.

Palmer (R. G.). **Apple Maggot Emergence in western New York.**—*J. econ. Ent.* **41** no. 6 p. 993. Menasha, Wis., 1948.

For some years it has been assumed that emergence of adults of the apple maggot [*Rhagoletis pomonella*, Walsh] in western New York begins in late June or early July and reaches a peak about 15th July. However, in 1948 no flies had emerged by 15th July in a cage over an area on which infested apples had been distributed late in 1947. Puparia dug up near the cage and kept indoors in glass jars gave rise to one adult by 28th July, and on 29th July 30 flies were found in the cage. Flies continued to emerge in the cage in fair numbers throughout the first week of August and in smaller numbers throughout the next two weeks, after which no further observations were made. It was evident that the control measures applied in late June and early July were inadequate against the heavy emergence at the beginning of August, and considerable fruit infestation was reported in this area in 1948. Further emergence records were to be made in 1949, and it will apparently be necessary to check the dates of emergence each season in order to time the spray applications.

Suneson (C. A.) & Bailey (S. F.). **Aphid Injury to Wheat.**—*J. econ. Ent.* **41** no. 6 p. 994, 1 fig., 7 refs. Menasha, Wis., 1948.

In 1946 and 1947, 70–80 per cent. of the stems of wheat of the Italian variety Mentana growing in plots at Davis, California, broke at basal internodes late in May and before full maturity, the primary cause being apparently Aphids. In both years Aphids were abundant throughout the nurseries early in April, but the populations were soon reduced by predacious Coccinellids. The evidence suggests that in the variety Mentana, Aphids congregate between the stem and leaf sheath at lower internodes, where they are protected from their predators. Feeding is concentrated on a restricted area for some time, and results in various malformations of 1–3 of the lower internodes, ranging from enlargement and moderate stem distortion to constriction and kinking. The latter type of injury results in breakage by wind. Aphids taken from such distorted stems after the first observed breakages in 1947 were identified as *Rhopalosiphum prunifoliae*, Fitch. This type of injury is relatively rare on other varieties of wheat and renders Mentana unsuitable for cultivation in California.

Another type of injury, characterised by stem and sometimes leaf distortion above the top node, occurs on occasional culms of wheat in California. It

also appears to result from persistent concentrated feeding by Aphids and would reduce yields materially if it were more general. Both types of injury appear to be purely mechanical.

SEIL (H. A.). **Estimation of Pyrethrins.**—*Soap & sanit. Chem.* **23** no. 9 pp. 131, 133, 1 fig. New York, N.Y., 1947.

Because variations in technique in the use of the Seil method for the determination of pyrethrins occur in different laboratories, the author republishes his methods of determining pyrethrins in pyrethrum flowers, mineral-oil sprays, extracts containing approximately 2 per cent. pyrethrins and pyrethrum concentrates, exactly as he now carries them out.

BROWNING (H. C.), FRASER (F. C.), SHAPIRO (S. K.), GLICKMAN (I.) & DUBRÛLE (M.). **The biological Activity of DDT and related Compounds.**—*Canad. J. Res.* (D) **26** no. 5 pp. 282–300, 27 refs. Ottawa, 1948.

The results are given of tests in which the insecticidal potencies of p,p′ DDT and 67 other compounds were compared, and preliminary observations were made of the toxicity of a few of them to mice when administered by forced feeding. Insecticidal potency was tested on *Drosophila melanogaster*, Mg., by using as test surfaces the inner sides of glass containers that had been wetted with acetone solutions of the compounds and dried. The reciprocal of the concentration of a compound (in mg. per 100 cc. acetone) that gave about the same mortality as a solution of 1 mg. DDT per 100 cc. is used to express its relative potency. The compounds comprised 54 related to DDT, including o,p′-DDT, halogen and other analogues, reduced compounds, carbinols and their esters, ethanones, benzophenones, sulphones, and diphenylamines, and 14 miscellaneous compounds. All were less toxic than p,p′-DDT except γ benzene hexachloride, which had a relative potency of about 5. Of the other compounds, the most active were the fluorine analogues and carbinol esters; o,p′-DDT was completely inactive. Some compounds were tested for synergism, but none was found.

In a discussion of the results with reference to the literature, it is stated that all investigators who have worked with 1,1-bis(4-fluorophenyl)-2,2,2-trichlorethane (fluoro-DDT) have found it to be insecticidal, but their estimates of its relative toxicity vary widely, and it is suggested that this may be due to its volatility. In the present tests, 1-(4-chlorphenyl)-2,2,2-trichlorethanol (carbinol-DDT) acted more rapidly than DDT and its mode of action appeared to differ since the insects killed by it died as though narcotised. The authors' tests on toxicity to mammals and those of other investigators show that compounds with high insecticidal activity produce neurotoxic symptoms in mammals, but are not necessarily highly toxic to them, and that compounds with high mammalian toxicity are not necessarily insectidal. There is some evidence that this may be due to differences in the mode of entry into the tissues of the two groups [*R.A.E.*, A **36** 174], which can be through the integument in insects, but does not take place by this means to any great extent in mammals. With regard to theories proposed to account for penetration through the insect cuticle, an examination of the results with 14 compounds of which the solubility in oil was known showed that four that were less soluble than DDT were inert or only slightly insecticidal and that none of the six that were most toxic had low solubility. No constant relation could be found between insecticidal activity and ease of dehydrochlorination [*cf.* **36** 274, etc.], there was no clear association of either fat solubility or toxic properties with particular parts of the molecule [**35** 203], and the attribution of specific properties to specific parts of the molecule is considered unjustifiable. From a

consideration of the chemical structure of 16 compounds with relative potencies varying from 0·01 to 0·4, the essentials of an active molecular structure were found to be a two-carbon chain with one para-substituted phenyl ring on carbon 1 and a di- or tri-halogen group on a saturated carbon 2. Steric factors are also important.

Browning (H. C.), Shapiro (S. K.) & Dubrûle (M.). **The insecticidal Activity of DDT and related Compounds against different Insect Species.**—*Canad. J. Res.* (D) **26** no. 5 pp. 301–306, 18 refs. Ottawa, 1948.

In the tests against *Drosophila melanogaster*, Mg. [see preceding abstract], the relative potencies of p,p′ DDT, 1,1-bis(4-fluorophenyl)-2,2,2-trichlorethane (fluoro-DDT) and 1-(4-chlorphenyl)-2,2,2-trichlorethyl acetate (acetoxy-carbinol DDT) were 1, 0·2–0·4 and 0·1, respectively, and those of 1-(4-chlorphenyl)-2,2,2-trichlorethanol (carbinol-DDT), 1,1-bis(4-methylphenyl)-2,2,2-trichlorethane (methyl-DDT) and 1-(4-chlorphenyl)-1-phenyl-2,2,2-trichlorethane (monochlor-DDT) were 0·02, 0·01 and 0·01. These compounds were tested against other insects to determine specific activity and the validity of using *D. melanogaster* as an indicator of insecticidal efficiency. Glass containers treated with acetone solutions [*loc. cit.*] were used in tests with adults of *Calandra granaria*, L., and *Tribolium confusum*, Duv., nymphs of *Oncopeltus fasciatus*, Dall., and larvae and adults of *Ephestia kuehniella*, Zell., and containers with powders of the pure compounds on the bottom in tests with nymphs of *Blattella germanica*, L. DDT was used in the solutions at a concentration of 2·5 mg. per 100 cc., which gave 30–80 per cent. mortality of all species, and against *B. germanica* at a rate of 50 mg. per ½ pint milk bottle which gave 37 per cent. kill. The other compounds were used at concentrations and rates equivalent on the basis of relative potency. None of the compounds was toxic to the larvae of *E. kuehniella*.

With each compound there were examples of anomalous action. The fluorine analogue was twice as toxic as DDT to *Blattella*. The acetoxy-carbinol, inactive against *Oncopeltus*, *Ephestia* and *Tribolium*, was relatively potent against *Blattella*. The carbinol gave 100 per cent. kill of *Oncopeltus* and was as effective against it as DDT when its concentration was reduced to that of the latter. Methyl-DDT and monochlor-DDT were inactive against *Tribolium*, though as toxic as expected to the other insects. In general, however, the results agreed with those expected on the basis of the tests with *D. melanogaster*, which is therefore considered to be a reliable indicator of insecticidal efficiency.

The results given by some of the compounds are compared with those obtained by other investigators, and the reasons for specificity discussed with reference to the literature. It is probably due to differences in the nature of the insect integument and the chemo-physical properties of the compounds.

Lindgren (D. L.), Gearhart (P. D.) & Vincent (L. E.). **Nylon Fumigating Tents.**—*Calif. Citrogr.* **32** no. 4 p. 142, 2 figs. Los Angeles, Calif., 1947.

The tents used in California for fumigating *Citrus* trees with hydrocyanic acid gas have for many years been made of 7- or 8-oz. U.S. army duck or 2·50 drill, which are heavy, but have tearing strength sufficient to bear dragging over the trees and are woven tightly enough to hold the gas fairly well, though better retention of gas is desirable. Before the war, the pulling of tents from tree to tree was accomplished by 2–6 men and had to stop when the tents got damp and increased in weight, but during the war, mechanical tent pullers were developed, and the tents could be manipulated with these even when wet. However, the initial cost of a mechanical tent puller is high, and occasional breakdowns and repairs are costly and interrupt the work.

In November 1946, a 55-ft. tent was made of nylon. It weighed only about a third as much as an 8-oz. duck tent and about half as much as a drill tent and required less than a third of the effort to pull it over a tree and little more than a third to take it off. The difference in ease of handling was not entirely a matter of weight, but was partly due to the fact that the nylon had a hard finish and slid over the trees. The ease with which the nylon tent was pulled from tree to tree suggests the possibility of eliminating the mechanical tent puller. Other advantages of nylon are that it is made in greater widths, so that the sewing of a tent is halved, it is not attacked by mildew, it increases in weight by less than 50 per cent. when wet, whereas canvas increases by 120 per cent., and it is more than twice as difficult to tear as canvas. It should not catch readily as it is hard and smooth and light in weight, and its draping ability appears to be satisfactory; it was observed that very slight air movements tended to cause the nylon tent to flutter or billow, when the canvas tents showed no movement.

Field tests in which an 8-oz. duck tent and the nylon tent were compared indicated that the concentration of HCN dropped slightly more rapidly under the latter, but the significance of this difference cannot be determined until more extensive tests are made. The porosity of the nylon tent can be altered by changing the weave or by calendering the woven fabric. Counts of red scale [*Aonidiella aurantii*, Mask.] on a few trees showed a kill of 99·5 per cent. on trees covered with the nylon tent and 99·7 per cent. on those covered with 8-oz. duck.

MATHIS (W.). **Biology of the Florida Red Scale in Florida.**—*Florida Ent.* **29** no. 2–3 pp. 13, 15–35, 3 figs., 10 refs. Gainesville, Fla., 1947.

In view of the increasing importance in recent years of *Chrysomphalus ficus*, Ashm. (*aonidum*, auct.) on *Citrus* in Florida, especially on the lower east coast, its bionomics were investigated in St. Lucie county in 1939–43 [*cf. R.A.E.*, A **29** 474] to provide a basis for work on control. This paper contains an account of the results, together with notes on the history of the Coccid in Florida, a list of some 200 plants attacked by it there, and descriptions of all stages of both sexes. The following is based partly on the author's summary. Eggs are deposited under the dorsal scale of the female, and the crawlers emerge and settle on the fruits and leaves of *Citrus* in a short time during the warmest seasons. When heavy infestations occur, the vitality of the trees and the yield and grade of the fruit are lowered. Two moults occur in the development of the female and four in that of the male. The time required to complete development at mean temperatures of 83 to 61°F. ranged from 28 to 78 days for the male and from 26 to 76 days for the female. Fertilisation of the female, which is necessary for reproduction, is believed to occur shortly after completion of the second moult. The females on fruits produced more young than those on leaves, and the development of a generation required 45–153 days, and there could be 5–6 generations in the year at a mean temperature of 74°F.

Of the Coccids found on leaves, 59 per cent. were females, and 96 per cent. of the males and 13 per cent. of the females were found on the upper surfaces. Gravity and light seemed to be the predominating factors affecting this distribution, gravity having the greatest effect on the males and light on the females. The number of ovipositing females was largest in August, and the number of living scales in all stages reached a peak in September. Both numbers were smallest in March. Preliminary work indicated that the physical condition of the trees influences the scale population and that trees in the best physical condition are likely to have the most scales [*cf.* **36** 83].

The natural enemies collected comprised *Aspidiotiphagus lounsburyi*, Berl. & Paoli, which was numerous in some groves and usually parasitised the

immature stages, and the predators, *Chilocorus stigma*, Say, which was the most abundant and of which both the larvae and the adults fed on all stages of the scale, *Chrysopa lateralis*, Guér., and the mite, *Hemisarcoptes malus*, Shimer ; the Encyrtid, *Pseudhomalopoda prima*, Gir., was collected in Orlando, further north. The natural enemies were the most effective in winter, but did not give effective control, as they were most abundant after the peak of scale infestation had occurred and most of the damage had been done. Temperatures at or below freezing point killed many females in two groves in January 1940, and violent wind and rain in August 1939 destroyed many crawlers that had emerged but not yet settled.

WOLFENBARGER (D. O.). **Tests of some newer Insecticides for Control of subtropical Fruit and Truck Crop Pests.**—*Florida Ent.* **29** no. 4 pp. 37–44, 6 figs., 4 refs. Gainesville, Fla., 1947.

The results are summarised of investigations in the subtropical areas of Florida on the control of some insects attacking fruit and vegetable crops. Since BHC (benzene hexachloride) and sabadilla gave promising control of *Corythucha gossypii*, F., on *Annona montana*, but a 5 per cent. DDT dust was unsatisfactory, the first two were tested against a severe local infestation of another lacebug, *Acysta perseae*, Heidemann, on avocado. One day after dusting, the numbers of lacebugs per leaf were 9·2 on untreated trees and 0·3 and 2·7, respectively, on those treated with BHC (1 per cent. γ isomer) and 10 per cent. sabadilla, but the young that hatched about a week later repopulated the dusted trees, and the numbers were the same on all trees 16 days after treatment.

When applied to the trunks and larger branches of guava trees for the control of the ant, *Wasmannia auropunctata*, Roger, which was troublesome to men picking the fruit, sprays containing 1, 2 and 3 lb. 50 per cent. wettable DDT, 0·25, 0·05 and 0·025 per cent. γ BHC and 0·5, 0·1 and 0·05 per cent. chlordan (1068) reduced the numbers of ants per linear foot of trunk from 103 to 8, 1 and 2, 0, 5 and 1, and 0, 2 and 4 after three days, and dusts containing 1 and 0·5 per cent. γ BHC reduced them to 16 and 24. BHC lost its effectiveness more rapidly than DDT and chlordan, but 54 days after treatment, the numbers were still significantly less on all treated trees but those receiving the lowest concentration of BHC in a dust or spray than on untreated ones.

In a planting of papaya, in which it was reported that the fruit was falling without maturing, owing to infestation by the Pyralid, *Homalopalpia dalera*, Dyar, thorough applications of sprays containing 1 lb. DDT per 100 U.S. gals., 0·1 per cent. γ BHC, 0·05 per cent. chlordan or 4 lb. lead arsenate with 4 lb. lime per 100 U.S. gals. reduced the average percentage of webs containing larvae from 81·7 to 8·4, 8·4, 14·4 and 16·5 seven days after treatment, and there were still significantly fewer on sprayed trees than on unsprayed trees after 36 days, except in the case of lead arsenate. A fungicide consisting of 2 lb. Fermate [ferric dimethyldithiocarbamate], 1 lb. zinc sulphate and ½ lb. hydrated lime per 100 U.S. gals. spray was added to all but the lead-arsenate spray.

Dusting okra [*Hibiscus esculentus*] with 10 per cent. sabadilla, 10 per cent. DDT and 1 per cent. γ BHC reduced the numbers of *Myzus persicae*, Sulz., per blossom bud from 24 to 12, 5 and 2 after one day (significant difference 10). The numbers continued to be significantly less for six days on plants dusted with DDT and BHC, but not on those receiving sabadilla. A second application of the same dusts, made 26 days after the first, when a large population of *Nezara viridula*, L., was present, reduced the average number of bugs per plant from 23 to 2, 16 and 6, respectively (significant difference 10) one day after treatment, but the numbers were practically the same on all

plants after eight days. A month later, dusts containing 10 per cent. sabadilla, 5 per cent. methoxy-DDT with sulphur, and 1 per cent. γ BHC with sulphur were applied ; the numbers of bugs per plot two days later were 2, 15 and 17, respectively, as compared with 17 for no treatment, and it is concluded that sabadilla was the best material tested against *N. viridula*.

Since Aphids became abundant on potatoes treated regularly with a fungicide (Dithane [disodium ethylene bisdithiocarbamate], zinc sulphate and lime), insecticides were added to it in one application when the plants were nearly grown. *M. persicae* was most abundant, but *Aphis gossypii*, Glov., became more numerous late in the season. The average numbers of Aphids per leaf after four days were 42 for the fungicide alone, 10, 2 and 1 when DDT was added at rates of ½, 1 and 2 pints per 100 gals. spray and 7, 4 and 0 when 0·01, 0·03 and 0·09 per cent. γ BHC was added. Control by the highest concentration of each insecticide was still good 20 days after treatment.

In an experiment against *A. gossypii* on squash, a dust of nicotine sulphate and lime (1 : 9) gave complete control. Dusts containing 0·05–0·375 per cent. pyrethrins with a synergist, DDT, or γ BHC at various concentrations all caused significant reductions in the numbers of Aphids per leaf for 1–8 days, but caused plant injury.

Polivka (J. B.). **DDT for controlling the Larvae of the Japanese Beetle.**—*Fm Home Res.* **32** no. 246 pp. 107–110, 2 figs. Wooster, Ohio, 1947.

DDT and Ryanex (powdered stems of *Ryania speciosa*) were compared with lead arsenate in soil treatments against larvae of the Japanese beetle [*Popillia japonica*, Newm.] in turf in Ohio during 1945–46. Lead arsenate and Ryanex were used at 500 lb. per acre, and a dust containing 50 per cent. DDT at 25, 50 and 75 lb. per acre ; all the materials were diluted in a fertiliser, and the applications were made on 2nd October 1945. Comparisons of the numbers of overwintered larvae in treated and untreated plots on 8th May and 4th June 1946, indicated that DDT had given 70·3–93·2 and 97·9–100 per cent. control, respectively, the rate of 50 lb. per acre being the most effective, whereas lead arsenate had given 67·6 and 83 per cent. By 1st October, when larvae of the succeeding generation were present, DDT had given 100 per cent. control at all rates and lead arsenate 98·6 per cent. Ryanex was of very little value against the overwintered larvae, but gave 60 per cent. control of the newly hatched ones. It is doubtful whether DDT would remain effective in the soil for as long as lead arsenate, but it should remain so for two years, or more, since it is insoluble in water and leaching is therefore likely to be insignificant.

Ting (P. C.). **A new Lily-infesting Weevil of the Genus *Dyslobus* Leconte (Coleoptera, Curculionidae).**—*Bull. Dep. Agric. Calif.* **36** no. 2 pp. 39–41, 1 fig. Sacramento, Calif., 1947.

Descriptions are given of the adults of both sexes of *Dyslobus liliphagus*, sp. n., a weevil that injures commercially grown Easter lilies (*Lilium longiflorum*) in south-western Oregon, together with characters distinguishing it from *D. wilcoxi*, Van Dyke, and *D. decoratus*, Lec.

Brian (M. V.). **On the Ecology of Beetles of the Genus *Agriotes* with special Reference to *A. obscurus*.**—*J. Anim. Ecol.* **16** no. 2 pp. 210–224, 6 figs., 9 refs. London, 1947.

The following is largely based on the author's summary of this account of field and laboratory observations on adults of *Agriotes sputator*, L., *A. obscurus*,

L., and *A. lineatus*, L., in southern England in 1946. Traps about 1 sq. ft. in area, composed of cut grass [*cf. R.A.E.*, A **37** 136] of which about one-fifth was renewed each day, were placed on soil that had previously been made firm and used in distribution studies in a newly-ploughed field that had been under pasture for many years. Distinct differences were found in the density distributions of the three species, even in areas only 15 yards apart. Day-to-day variations in catch showed good correlation between the species, but on good days, *A. sputator* tended to increase relative to the others. Emergence from the soil occupied a period of about three weeks, *A. sputator* emerging later than the other two ; within species, the males appeared earlier than the females, though there was considerable overlapping, but the ratio of males to females showed a discontinuous decline during the early part of the active season. At any particular time, the proportion of males was largest in *A. obscurus*, and smallest in *A. sputator*.

The activity of adults of *A. obscurus* was studied by means of an automatic recorder in an insectary, and it was found that activity between midnight and 6 a.m. was positively correlated with temperature, whereas that between 6 a.m. and noon was correlated positively with temperature and negatively with hours of sunshine. Most activity occurred in the evening, and it is suggested that cloud is an important factor in the life of the beetles. Although flight appears to be rare in England, adults of *A. obscurus* and *A. lineatus* kept in a warm, humid glasshouse flew frequently and regularly during March–May. A new electronic detector method proved practicable for studying the movements of beetles crawling in grassland ; it comprised marking a beetle with a trace of radium sulphate, replacing it on the soil and thereafter locating it by means of a Geiger-Müller electronic discharge tube that detects and localises the radiation and operated a loud-speaker without valve amplification. The radium sulphate was placed between thin aluminium foil disks, 2 mm. in diameter, which were inserted under the elytra and held in place by resin adhesive. The beetles did not appear to be incommoded, and survived for apparently normal periods. Only females of *A. obscurus* were tested, and the results supported the theory suggested by other evidence that the beetles are relatively sedentary, although there were indications of larger directional movements as well.

At the beginning of the active season, the average live weight of males was in all cases less than that of females, though there was considerable overlapping, and the difference increased with mean species weight. The small changes in live weight that ensued in *A. obscurus* are discussed in relation to the environment provided in a pot experiment in which eight crops were tested for their effects on fecundity and length of life. This experiment showed that more progeny (eggs and larvae) were produced on *Lolium perenne*, *Agrostis tenuis* and *Festuca ovina* than on mustard, wheat, flax, clover or potato, but fewer were produced on *Lolium* than on the other two grasses, and the number produced on flax was lower than on any plant except potato. On the whole, the heaviest females laid most eggs. Females survived longer than males in all cases and, in general, the beetles survived longest on crops on which most eggs were laid. It was also found that death of the population occurred over a brief period on crops that did not favour oviposition and survival, and over a longer period on crops that did.

Salt (G.) & Hollick (F. S. J.). **Studies of Wireworm Population. III. Some Effects of Cultivation.**—*Ann. appl. Biol.* **36** no. 2 pp. 169–186, 5 figs., 8 refs. London, 1949.

The following is almost entirely the authors' summary of this third paper of a series [*cf. R.A.E.*, A **32** 306 ; **37** 7], in which data are given on populations

of wireworms (*Agriotes*) in eight fields in Cambridgeshire during 1942–44, before and after they were ploughed from old grass. The numbers of wireworms in successive collections from five fields declined during the first year of cultivation to 25 per cent. of the number present before ploughing ; this result was largely confirmed by observations in the other fields. The decline in numbers was accompanied by a change in the composition of the wireworm population ; the marked inverse correlation between number and size of larvae, which held for the wireworm populations under grass [*cf.* **32** 307], progressively altered towards uniform numbers of the different size-groups. The incidence of natural control on the different sizes of larvae was obscured by their growth ; medium-sized and large larvae that died were replaced as the smaller larvae increased in size, and therefore appeared from the population-size histograms to have suffered less mortality.

Three groups of factors are considered in relation to the decline in numbers after ploughing. Direct observation showed that many wireworms were destroyed in the actual process of cultivation. Evidence was insufficient to prove that the physical condition of cultivated soil adversely affects the wireworms. Comparison of the smaller size-groups in pasture and in the cultivated fields showed that the wireworm population failed to replenish itself under arable conditions.

FINNEY (D. J.). **The Adjustment for a natural Response Rate in Probit Analysis.**—*Ann. appl. Biol.* **36** no. 2 pp. 187–195, 5 refs. London, 1949.

The following is the author's summary. A revised scheme of computation is suggested for the fitting of a probit regression line to quantal response data which have to be adjusted because of the occurrence of natural responses not caused by the stimulus under test [*cf. R.A.E.*, A **32** 308]. The calculations lead to the same results as those proposed when the method was first introduced [*loc. cit.*], but have the advantages of close similarity with multiple regression calculations and of simplifying the test of heterogeneity. The new scheme is illustrated on the example used in the earlier paper. A table of weighting coefficients for use with high natural response rates is presented.

WADLEY (F. M.). **Dosage-Mortality Correlation with Number treated estimated from a parallel Sample.**—*Ann. appl. Biol.* **36** no. 2 pp. 196–202, 7 refs. London, 1949.

The following is the author's summary. When the number of organisms treated in a dosage-mortality study is not known exactly, but is estimated from a sample, weighting must be modified. Weights based on Poisson expectation are worked out and tabled. Maximum likelihood equations, designed to improve the estimate of number treated, are presented. Two numerical examples are worked out to illustrate the use of the weights and equations.

ANSCOMBE (F. J.). **Note on a Problem in Probit Analysis.**—*Ann. appl. Biol.* **36** no. 2 pp. 203–205, 4 refs. London, 1949.

The following is the author's summary. The statistical treatment of dosage-mortality data when the number of survivors is counted, but not the total number of organisms in each sample, the latter being estimated from an untreated sample, has been discussed by Wadley [see preceding abstract], on the assumption of Poisson variation in the number of organisms per sample. The procedure to be followed when a wider hypothesis is made that the number of organisms has a negative binomial distribution is described here ; both the arithmetical analysis of the results and the optimum arrangement of the samples are considered.

STRINGER (A.). **The insecticidal Action of some D.D.T. Analogues and Chlorinated (4-Chlorophenyl)-ethanes.**—*Ann. appl. Biol.* **36** no. 2 pp. 206–212, 11 refs. London, 1949.

In view of the various theories put forward to explain the insecticidal action of DDT [*cf. R.A.E.*, A **35** 203] and the reported toxicity of a German insecticide formerly designated Lucex, which is prepared by the side-chlorination of 4-chlor-1-ethyl benzene and has as its active ingredient one 4-chlorphenyl group and a side-chain said to be chlorinated to about $-C_2HCl_4$, various analogues of DDT and some of the compounds likely to be present in Lucex were compared against *Calandra granaria*, L. DDT and its analogues were tested as oil films, and the other compounds as deposits from acetone solutions [*cf.* next abstract]. Tests of the effect of p-substituents on the toxicity of DDT showed that the bromo-analogue is about as toxic as DDT and the iodo-analogue less than half as toxic, when concentrations are measured on the molar scale. Compounds used to test the effect of modifying the trichlorethylidene group were αα-bis(4-chlorphenyl)-ethane, -β-chlorethane, -ββ-dichlorethane (DDD), -αβ-dichlorethane, -αβββ-tetrachlorethane, -ethylene, -β-chlorethylene, and -ββ-dichlorethylene. With the exception of DDD, they possessed little or no toxicity. The most toxic member of the series of chlorinated (4-chlorphenyl)-ethanes tested was considerably less toxic than DDT, when compared with it in oil films ; the general trend of toxicity in the series showed a correlation with the degree of chlorination on the ethane part of the molecule, but complete chlorination resulted in a virtually non-toxic compound.

STRINGER (A.). **A simple Method for assaying Contact Toxicities of Insecticides, with Results of Tests of some Organic Compounds against *Calandra granaria* L.**—*Ann. appl. Biol.* **36** no. 2 pp. 213–224, 6 graphs, 12 refs. London, 1949.

Methods are described for estimating the toxicity of insecticides by placing adults of *Calandra granaria*, L., on Whatman filter paper on which the material under test had been spread by dissolving it in oil or in a volatile solvent such as acetone or alcohol and applying a measured quantity of the solution by means of a pipette. The results with the crystalline deposits from the volatile solvents were satisfactory in the case of DNC (dinitro-o-cresol) but not in that of DDT ; with the latter compound, the nature of the solvent and the substrate affected the results.

Of the organic compounds tested as deposits from volatile solvents, DNC was 2·6 times as toxic on a weight basis, and about equally toxic on a molar basis, as its phenyl mercury derivative, and was considerably more toxic than phenyl diazopiperidine. Hexamethylcyclohexane and hexaethylcyclohexane, which were included because of their similarity to γ hexachlorcyclohexane (benzene hexachloride) and the suggestion that the physiological activity of the latter is due to its antagonism towards *i*-inositol [*cf. R.A.E.*, A **33** 257 ; **37** 16, etc.], showed negligible toxicity ; and tetranitrocarbazole, 4-chlorphenyl-chlormethylsulphone, tetranitro-diphenol, di-2-pyridylamine, acenaphthylene dibromide, acenaphthylene dithiocyanate and two acetyl derivatives of phenyl trichlormethyl carbinol were all ineffective.

The method proved satisfactory for films of DDT in oil. Of the other compounds compared with it in oil films, the relative potencies of toxaphene and parathion (diethyl p-nitrophenyl thiophosphate) were 0·16 and 11·1, and chlordan was considerably less toxic than DDT over the range of concentrations tested. DDT and parathion were compared in castor oil, since parathion appeared to be immiscible with P31 petroleum oil, the solvent used in the other oil-film tests.

Some of the factors that govern the toxicity of DDT in solid and oil films are discussed. In the case of solid films at high concentrations, the insect picks up DDT at a rate independent of the weight present, since the action of this compound is slow, and kill is not increased by additional increments of insecticide. At lower concentrations, there is a regression of kill on weight of deposit, the sampling rate being below the maximum level, but in these cases, crystal size and distribution play a part in the effect. In the case of oil films, their thickness may determine the availability of DDT and increased slope (probit *v.* log deposit) would be expected with increased thickness. Adequate regression lines were obtained, however, if one dosage was used and the concentration of insecticide increased.

SMIT (B.). **The Control of Household Insects in South Africa (with a Chapter on Rats and Mice).**—*Bull. Dep. Agric. S. Afr.* no. 192 (3rd edn. revd.) 67 pp., 26 figs., 16 refs. Pretoria, 1946. Price 6*d.*

Most of the changes and additions to the information in this third edition of a bulletin on the bionomics and control of insects that may be pests in houses in South Africa [*cf. R.A.E.*, A **28** 78; **31** 472] result from recommendations for the use of DDT. Additional pests dealt with are the wood-boring beetles, *Hylotrupes bajulus*, L., and *Anobium punctatum*, Deg. [**34** 12].

THOMPSON (W. R.). **Interim Report on two Scales attacking the Bermuda Cedar.**—3 pp. [Hamilton] Dep. Agric. Bermuda, 1947.

An investigation in progress in Bermuda in February 1947 showed that the infestations of Bermuda juniper [*Juniperus bermudiana*] by the introduced Coccids, *Carulaspis* (*Diaspis*) *visci*, Schr., and *Lepidosaphes newsteadi*, Šulc, were localised but had spread rapidly and caused heavy damage. At that time, *C. visci* was reproducing and spreading slowly, but was very heavily attacked by parasites, of which over 99·5 per cent. were *Aspidiotiphagus lounsburyi*, Berl. & Paoli. This Aphelinid was probably introduced in small numbers with the scale, and appeared likely to be able to control it, though not before many more trees had been killed [*cf. R.A.E.*, A **37** 38]. *L. newsteadi* was not reproducing and spreading at the time, but was considered to be more dangerous than *Carulaspis*, since it was little attacked by parasites [*cf.* **37** 37]. Spraying was considered impracticable and liable to cause harm by destroying parasites, and shipments to Bermuda of several natural enemies of allied Coccids were therefore made. Two colonies of one of them, the Coccinellid, *Chilocorus distigma*, Klug, had already been liberated in infested areas when this report was written.

GADD (C. H.). **Studies of Shot-hole Borer of Tea. 2. Galleries.**—*Tea Quart.* **18** pt. 4 pp. 114–124, 1 pl., 13 refs. Talawakelle, 1947.

In this second part of a series [*cf. R.A.E.*, A **36** 251], the author describes the different types of galleries bored by *Xyleborus fornicatus*, Eichh., in tea stems of different thicknesses and in castor [*Ricinus communis*] in Ceylon. They are usually made in positions in which the fungus that serves as food for the larvae is most likely to grow satisfactorily, and do not appear to hinder the normal flow of sap, but tea branches tend to break at the level of the galleries if external force is applied. The entrances to the galleries are eventually closed by the growth of the cambium, but this does not normally occur until the brood has developed and left and has no direct value in control by limiting the time for which the gallery is available. However, branches are less liable

to break when galleries have healed over and been covered with more new wood than when they are open. Manuring with nitrogen, potash and phosphoric acid was found to promote the healing of galleries, but did not diminish the damage as measured by the numbers of broken branches [*cf.* **33** 294]. The numbers of broken branches were greatest in plants giving the heaviest crops, and nitrogen caused the greatest increase in both yield and insect damage.

ROBERTSON (P. L.). *Eupteromalus* **sp. as a Hyperparasite. Some Indication of its Influence on the Establishment of** *Angitia cerophaga* **in New Zealand.**— *N. Z. J. Sci. Tech.* **29** (B) no. 5 pp. 257–265, 5 figs., 14 refs. Wellington, N. Z., 1948.

Eupteromalus sp. is a hyperparasite that is possibly native to New Zealand and has been recorded there from *Pteromalus puparum*, L., and the European and American strains of *Apanteles glomeratus*, L., all parasitising *Pieris rapae*, L., and from an unidentified native species of *Angitia* [*cf. R.A.E.*, A **28** 155], the introduced *A. cerophaga*, Grav., and *Thyraeella* (*Diadromus*) *collaris*, Grav., parasitising *Plutella maculipennis*, Curt. It was recognised in 1936 that it might adversely affect the parasites being introduced against *P. maculipennis*. Importations from England of *A. cerophaga* and *A. fenestralis*, Hlmgr. (two supposed species of which the identity is stated to have been later lost through interbreeding) had already been begun [*cf.* **27** 262], and the effect of the hyperparasite on *A. cerophaga* was studied during the seasons of 1936–37 and 1937–38.

During the first year, *A. cerophaga* was being reared in field cages at Hawke's Bay, where outbreaks of *Plutella* on crucifers had occurred each year. The cages were covered with an open-mesh material that would not exclude *Eupteromalus*, and parasitism by it seriously reduced the population of *Angitia*. The extent of this was difficult to estimate because superparasitism was common, up to three adults of *Eupteromalus* being reared from one pupa of *Angitia*, and many eggs, larvae and pupae of *Eupteromalus* failed to complete development and were only revealed on dissection. During 1937–38, *A. cerophaga* was reared in field cages at Nelson, where it was thought that *Eupteromalus* might increase less rapidly. Hyperparasitism was low during the early part of the season, being only 1·5 per cent. in early November, but steadily increased from then on until it reached 42 per cent. in February. Total mortality of *Angitia* pupae increased from 30·9 to 94·5 per cent. during this period, but its rate of increase was less rapid than that of hyperparasitism during the earlier months, when the latter was unduly favoured by the aggregation of *Angitia* pupae in the cages. Field collections were examined during the same year. Those from an experimental area at Cawthron Institute, where early liberations of *Angitia* were made, showed that primary parasitism reached a high level in December and January, but that hyperparasitism did not increase until after this had occurred. The latter reached a peak at the end of January, when it caused a marked and sudden drop in the *Angitia* population, and both then decreased for some weeks, though *Eupteromalus* decreased so much more rapidly than *Angitia* that it had practically ceased its attacks by mid-March. *Angitia* then increased slightly, whereupon *Eupteromalus* reappeared. A comparable course was followed in the Nelson town area, but on the Waimea plains, neither *Plutella* nor *Angitia* was common, and under these conditions, hyperparasitism was negligible.

It was thus evident that though *Eupteromalus* had been a serious factor in the field cages, it did not totally destroy the population of *Angitia* in the field and that the latter retained some value as a primary parasite. This was later shown to be great [*cf.* **36** 244, etc.].

KANERVO (V.). **Ueber das Massenauftreten der Gammaeule, *Phytometra gamma* L. (Lep., Noctuidae), im Sommer 1946 in Finnland.** [On the Mass Occurrence of *Autographa gamma* in the Summer of 1946 in Finland.]—*Ann. ent. fenn.* **13** no. 3 pp. 89–104, 5 figs., 2 maps, 7 refs. Helsinki, 1947.

Autographa (*Phytometra*) *gamma*, L., is usually of little importance in Finland, but a severe outbreak developed in 1946 in the southern and south-western part of that country. Larvae and adults had been noticeably abundant in the previous autumn, and the overwintering population (which apparently includes full-fed larvae and pupae and possibly also adults) was probably augmented by immigrants from the south. Moths of this generation appeared in late May and were most abundant at the end of June. Most of the eggs were laid on weeds, and the larvae, which began to hatch in the third week of June, fed on these until they had no more food available and then migrated to crops. They were almost full-fed by that time, and pupated in early or mid-July so that damage, though severe, lasted for only 1–2 weeks. First-generation adults were present from mid-July to the end of August and extremely common, but few eggs were laid, so that no more damage occurred, and the moth was not numerous in 1947.

Notes are given on the dates of occurrences of the various stages in different localities, together with lists of the wild and cultivated plants attacked. The crops that suffered most were beet, flax, peas and clovers ; root-crops were sufficiently advanced at the time of the outbreak to recover, but seed crops of clover and flax were totally destroyed. Losses were estimated at 15–20 million Finnish marks.

Only about 10 per cent. of the first-generation larvae were parasitised, some 75 per cent. of these by *Voria ruralis*, Fall., and 24 per cent. of the pupae. Other than *Voria*, the parasites concerned were *Pales pavida*, Mg., *Blondelia* (*Lydella*) *nigripes*, Fall., *Nemorilla floralis*, Fall., *Pimpla turionellae*, L., *P. instigator*, F., *Apechthis compunctor*, L., *Ephialtes* (*Epiurus*) *stercorator*, F., *Ichneumon* (*Stenichneumon*) *militarius*, Thnb., *I.* (*S.*) *culpator*, Schr., *Apanteles glomeratus*, L., *Gelis* sp., and an unidentified Chalcid. At one place, 55 per cent. of the prepupae and pupae examined in August were found to be parasitised or killed by disease. The larvae were also attacked by predacious insects, including *Picromerus bidens*, L., and *Anatis ocellata*, L., and birds afforded some control.

RUMMUKAINEN (U.). **Ueber das Auftreten des Laubholzbohrers, *Hylecoetus dermestoides* L. (Col., Lymexylonidae), an Birken.** [On the Occurrence of the Borer of deciduous Wood, *H. dermestoides*, on Birches.]—*Ann. ent. fenn.* **13** no. 3 pp. 144–148, 7 refs. Helsinki, 1947.

In the course of investigations in the summers of 1946 and 1947 on the causes of the drying up of birches in south-western Finland, larval galleries of *Hylecoetus dermestoides*, L., were found in all of the four affected trees examined in detail. Two of the trees were also infested with a fungus of the genus *Fomes*, and two with *Armillaria mellea*. The eggs had been laid in still living areas at the edge of the parts that had dried up in the preceding year, and the larvae had tunnelled to a depth of 2 cm. into the sound wood, thus accelerating the process of desiccation. They appeared to have been the primary cause of it in the trees infested with *Armillaria* ; their galleries were free from the fungus and they did not penetrate into the areas occupied by it. In the trees infested by *Fomes*, however, the fungus was the primary cause of the drying up ; the larvae did not avoid contact with it, and its progress between the bark and the

wood was much assisted by their galleries, which also facilitated its penetration to the outer surface of the trunks.

FRANZ (J.). **Lässt sich die notwendige Fangbaumzahl bei Borkenkäferkalamitäten berechnen ?** [Is it possible to estimate the necessary Number of Trap Logs to be used during Outbreaks of Bark-beetles ?]—*Allg. ForstZ.* **2** no. 24 repr. 4 pp., 11 refs. Munich, 1947.

The author reviews various methods that have been proposed for calculating the numbers of trap logs to be distributed in forests in outbreaks of barkbeetles. The latest is that of Thalenhorst [*R.A.E.*, A **37** 66], which is considered defective because it fails to take into consideration the natural mortality of the young beetles, the mortality caused by winter control measures, reproduction by the overwintered females, changes in the total area suitable for breeding on the trees, and the possibility of more than one adult emerging from the same exit hole. He points out that the different methods proposed lead to widely divergent results and that it is not known how far the methods developed for one region are applicable for another.

PAPERS NOTICED BY TITLE ONLY.

GOODHUE (L. D.), SCHULTZ (F. S.), INNES (N.) & STANSBURY (R.). **A Test Method for commercial Aerosol Dispensers.**—*Soap & sanit. Chem.* **23** no. 9 pp. 119–121, 4 figs. New York, N.Y., 1947. [*Cf. R.A.E.*, B **38** 33.]

KETTLE (D. S.). **The Speed of Action of insecticidal Sprays and Deposits and its Use in assessing the biological Efficiency of BHC, DDT and Pyrethrum** [and in the bioassay of γ benzene hexachloride in solutions of unknown strength, by tests on *Musca domestica*, L.].—*Bull. ent. Res.* **40** pt. 3 pp. 403–429, 8 figs., 21 refs. London, 1949. [See *R.A.E.*, B **38** 26.]

PAGE (A. B. P.), STRINGER (A.) & BLACKITH (R. E.). **Bioassay Systems for the Pyrethrins. I. Water-base Sprays against *Aëdes aegypti* L. and other flying Insects.**—*Ann. appl. Biol.* **36** no. 2 pp. 225–243, 16 figs., 13 refs. London, 1949. [See *R.A.E.*, B **38** 34.]

PAGE (A. B. P.) & BLACKITH (R. E.). **Bioassay Systems for the Pyrethrins. II. The Mode of Action of Pyrethrum Synergists.**—*Ann. appl. Biol.* **36** no. 2 pp. 244–249, 1 fig., 14 refs. London, 1949. [See *R.A.E.*, B **38** 36.]

HAWES (I. L.), MITCHELL (W. H.) & COON (E. L.). **Index VII to the Literature of American Economic Entomology January 1, 1940 to December 31, 1944.**—*Amer. Ass. econ. Ent.*, Spec. Publ. 7 [12+] 1063 pp. College Park, Md., 1948. Price $7.00. [*Cf. R.A.E.*, A **31** 272.]

CHU (H. F.). **How to know the immature Insects. An illustrated Key for identifying the Orders and Families of many of the immature Insects with Suggestions for collecting, rearing and studying them.**—[6+] 234 pp., 631 figs., 6⅓ pp. refs. Dubuque, Iowa, W. C. Brown Co., 1949. Price : spiral binding $1.50 ; cloth $2.50.

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The problem was discussed at the Commonwealth Entomological Conference in 1948, and a resolution passed urging the appointment of a committee to agree common names for established compounds. The Executive Council of the Commonwealth Agricultural Bureaux referred the recommendation to the British Standards Institution, as the appropriate body in the United Kingdom to deal with the matter. A Technical Committee for Nomenclature of Pest Control Products has now been appointed by the B.S.I. and includes representatives of Commonwealth countries, Government departments, scientific societies and manufacturers' organizations. The Committee meets under the Chairmanship of Mr. H. J. Jones, A.R.I.C., who is also Chairman of the Pest Control Products Industry Standards Committee of the Institution, with Dr. Catherine Tinker, A.R.I.C., as Secretary.

The Committee's terms of reference are: "To prepare standards for the nomenclature for insecticidal and fungicidal chemicals and other pest control products." It is working in the closest collaboration with the Standards organizations in Commonwealth countries, and with the Inter-Departmental Committee on Pest Control in the United States of America. Standards organizations in other countries have been informed of the formation of the Committee and of its proposed programme, and it is hoped that it may eventually be possible to arrive at international agreement on nomenclature.

CK (PCC) 9123: *3rd February*, 1950.

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CONTENTS.

	PAGE
AFRICA, EAST : Notes on Bush Locusts, especially *Phymateus aegrotus* ...	47
AFRICA, SOUTH : The Toxicity of Fruit-fly Bait-sprays to *Pimpla heliophila*	45
AFRICA, SOUTH : Damage to Tobacco by *Scirtothrips aurantii*	46
AFRICA, SOUTH : The Control of Household Insects	85
AMERICA, NORTH : Index VII to the Literature of Economic Entomology (*Title only*)	88
AUSTRALIA : Plant Communities in Relation to Locusts in New South Wales	45
AUSTRALIA : Insect Pests of Fabrics in Tasmania	45
AUSTRIA : An Outbreak of *Phyllaphis fagi* on Beech	49
AUSTRIA : An Outbreak of *Ips typographus* in 1946–47	49
AUSTRIA : Outbreaks of *Enarmonia diniana* in 1947	50
BERMUDA : Work on the Biological Control of Coccids on *Juniperus bermudiana*	85
BRITAIN : The Ecology of Beetles of the Genus *Agriotes*	81
BRITAIN : Effects of Cultivation on Wireworm Populations	82
CANADA : Experiments on the Control of Ptinids in Flour Warehouses ...	55
CEYLON : The Galleries made by *Xyleborus fornicatus*	85
FINLAND : An Outbreak of *Autographa gamma* in 1946	87
FINLAND : *Hylecoetus dermestoides* and Fungi on Birch	87
GERMANY : Tests of Phenothiazine against Insects	52
GUAM : The Finding of *Dacus ferrugineus dorsalis*	75
HOLLAND : Alatae of *Eriosoma lanigerum* on Apple in heated Greenhouses	50
HOLLAND : Colour Varieties of *Myelophilus piniperda*	51
INDIAN SUBCONTINENT : The Identity of a Species of *Drosicha* on Mango	46
NEW ZEALAND : The Influence of a Hyperparasite on the Establishment of *Angitia cerophaga*	86

CONTENTS—*cont.*

PAGE

SAMOA : The Establishment of *Scolia ruficornis* against *Oryctes rhinoceros* 48
U.S.A. : Quarantine Regulations against Pests of Plants 53
U.S.A. : Dusts against Insects on Cotton 53, 72
U.S.A. : A Virus Disease of *Colias eurytheme* in California 54
U.S.A. : Insecticides against *Hylemyia brassicae* in Washington 54
U.S.A. : Resistance of Pawnee Wheat to *Mayetiola destructor* in Kansas 56
U.S.A. : Insecticides against *Eulia velutinana* on Apple 57, 68
U.S.A. : Inhibition of Decomposition of DDT Spray Deposits on *Citrus* 58
U.S.A. : A new Method of evaluating Acaricides 58
U.S.A. : Dusts reducing Effectiveness of Tetraethyl Pyrophosphate against Mites 59
U.S.A. : Chlordan against Larvae of *Popillia japonica* 60
U.S.A. : Tests of Organic Insecticides against Pests in North Carolina ... 60
U.S.A. : Tests of Insecticides against *Diatraea saccharalis* in Louisiana 61
U.S.A. : *Melanoplus occidentalis occidentalis* in Nevada 62
U.S.A. : Treatments of Maize Ears against *Heliothis armigera* and *Laphygma frugiperda* 63
U.S.A. : Insecticide Dusts for Grasshopper Control in Texas 65
U.S.A. : Tests of Dusts against Cabbage Caterpillars 65
U.S.A. : Insecticide Treatments against *Taeniothrips simplex* on Gladiolus 66
U.S.A. : The Effect on Bees of dusting Lucerne with DDT 67
U.S.A. : DDT against Crawlers of *Lepidosaphes ulmi* 68
U.S.A. : An introduced Chrysomelid on Crucifers in Alabama 69
U.S.A. : Change of Food-plant Preference in *Colias philodice* 70
U.S.A. : A Species of *Typhlocyba* injurious to Prune 70
U.S.A. : Parathion and Chlordan against *Conotrachelus nenuphar* on Plums 71
U.S.A. : *Pediculoides ventricosus* attacking *Spilonota ocellana* in California 71
U.S.A. : Establishment of the Chinese Race of *Comperiella bifasciata* in California 72
U.S.A. : Acaricides in Sprays against *Tetranychus willamettei* on Raspberry 72
U.S.A. : DDT against Tenebrionids attacking *Capsicum* in California ... 73
U.S.A. : Occurrence of Thrips within Tomato Fruits 74
U.S.A. : A Palaearctic Buprestid found on Hollyhocks 74
U.S.A. : A Nitidulid infesting Maize Ears in Utah 75
U.S.A. : Liberation of *Hippodamia convergens* in the Yakima Valley ... 76
U.S.A. : The Time of Emergence of *Rhagoletis pomonella* in New York ... 76
U.S.A. : Aphid Injury to Wheat in California 76
U.S.A. : Nylon Tents for Fumigation of *Citrus* 78
U.S.A. : The Biology of *Chrysomphalus ficus* in Florida 79
U.S.A. : Insecticides against Fruit and Vegetable Pests in Florida ... 80
U.S.A. : DDT against Larvae of *Popillia japonica* 81
U.S.A. : A new Weevil infesting Lily in Oregon 81
WEST INDIES : Biological Control of *Aleurocanthus woglumi* at Nassau ... 69
A Booklet on Termites (*Review*) 45
Methods for the Bioassay of Contact Insecticides on *Calandra granaria* ... 47, 84
Effects of Humidity on Toxicity of Insecticide Films 48
The Action of Veratrine on Insects 51
Contributions to the Toxicology of DDT 52
A Method for the Generation of insecticidal Smokes 53
Acaricidal Properties of Compounds related to DDT 56
Assay of Toxicity of Derris or Cubé on a Fish 64
Relation of Droplet Size to Toxicity in Residual-type DDT-Oil Sprays ... 67
The Estimation of Pyrethrins 77
Comparative Experiments with DDT and related Compounds 77, 78
Methods of Analysis of Response Rates in Experiments 83
Insecticidal Action of DDT Analogues and Chlorinated (4-Chlorphenyl)-ethanes 84
Tests of the Action of Organic Compounds on *Calandra granaria* ... 84
The Planning of the Use of Trap Logs against Bark-beetles 88
A Test Method for commercial Aerosol Dispensers (*Title only*) 88
Bioassay of Insecticidal Sprays and Deposits (*Title only*) 88
Effects of Pyrethrin Sprays on flying Insects (*Title only*) 88
The Mode of Action of Pyrethrum Synergists (*Title only*) 88
A Key to immature Insects (*Title only*) 88
LEGISLATION : Quarantine Regulations against Pests of Plants in U.S.A. 53
LEGISLATION : Summaries of Plant-quarantine Restrictions in various Countries 53

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